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ABSTRACT

This document reports on three years of clinical research involving the development of effective clinical intervention procedures for children with slow language development. The assessment and treatment approaches discussed in the report are based upon the developmental model of grammar described in Developmental Sentence Analysis (DSA), a clinical procedure for evaluating the level of a child's grammatical development, from a tape-recorded sample of the child's spontaneous speech. The report contains an overview of project accomplishments; statistical information on DSA; material on interactive language development teaching and the use of this method with 25 clinical children; a group remediation program for children with atypical syntax, utilizing operant and programed procedures; and the dissemination of project information. Included are a list of references, 40 tables of findings, and six charts. (JM)

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THE ASSESSMENT OF GRAMMATICAL DEVELOPMENT IN CHILDREN AND THE CLINICAL PRESENTATION OF GRAMMATICAL STRUCTURE TO CHILDREN WITH LANGUAGE PROBLEMS

Roy A. Koenigsknecht and Laura L. Lee

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U.S. Department of
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THE ASSESSMENT OF GRAMMATICAL DEVELOPMENT IN CHILDREN AND THE CLINICAL PRESENTATION OF GRAMMATICAL STRUCTURE TO CHILDREN WITH LANGUAGE PROBLEMS

SECTION I

An Overview of Project Accomplishments

This monograph on the assessment of grammatical development in children and the clinical presentation of grammatical structure to children with language problems, is a report on three years of clinical research involving the development of effective clinical intervention procedures for children with slow language development. The primary purpose of this project was to refine a prototype of clinical-assessment and clinical-teaching which made recent information on children's development of syntax and morphology applicable and useful to speech and language clinicians (a) in the assessment of language disorders, (b) in the planning of more effective remedial procedures, (c) in the development of systematic instructional materials, (d) in the implementation of innovative teaching methods, and (e) in the objective measurement of clinical children's progress throughout the period of clinical teaching. The assessment and treatment approaches discussed in this monograph are based upon the developmental model of grammar described in Developmental Sentence Analysis (DSA) (Lee, 1974). DSA is a clinical procedure for evaluating the level of a child's grammatical development from a tape-recorded sample of his spontaneous speech. The procedure has been demonstrated in Developmental Sentence Scoring: A Demonstration Film (Koenigsknecht, Mulhern, and Lee, 1974). A clinical teaching method, Interactive Language Development Teaching, ILDT (Lee, Koenigsknecht, and Mulhern, 1974), has emerged from DSA and its developmental model of grammar. In ILDT the developmental aspects of language are utilized by structuring treatment goals according to the sequential pattern of normal language growth. Developmental Language Teaching: A Demonstration Film (Koenigsknecht, Mulhern, and Lee, 1974) shows a clinical application ILDT.

Developmental Sentence Analysis brought together and expanded two studies which had appeared previously in the literature (Lee, 1966; Lee and Canter, 1971). The former, Developmental Sentence Types, was a classification system for children's spontaneous utterances which were not yet in sentence form, and it attempted to reveal and evaluate the developing grammatical structures incorporated into these fragmentary utterances. The latter, Developmental Sentence Scoring, was a system of weighted scores given to a developmental order of emerging grammatical structures within complete subject-verb sentences. By means of these two techniques, a clinician could evaluate the level of grammatical development which a child had achieved, whether or not he was speaking in sentences. Through a U. S. Office of Education grant, Project No. 9-E-018, Contract No. OEG-5-9-235018-0033, language samples had been collected on 160 children between the ages of 3-0 and 6-11 and norms had been established for each six-month age group. Thus, a clinician could compare the language performance of clinical children with normally developing children in their same chronological age groups and could also measure their rate of progress throughout the period of clinical teaching.

The present U. S. Office of Education grant proposed to expand, refine, and integrate the two assessment procedures, under the name of Developmental Sentence Analysis and lead to treatment prototypes based upon the information growing out of DSA research, by accomplishing the following goals:

1. The addition of data from a two-year-old age group.
2. The verification or modification of the developmental order and the weighted scores by means of reciprocal averaging.
3. A detailed statistical analysis of language samples from the complete data of the children 2-0 to 6-11.
4. The development of a clinical language teaching technique which would make use of the information from the language samples. This procedure was given the name Interactive Language Development Teaching.
5. A three-year study of clinical children being evaluated by Developmental Sentence Analysis and treated by Interactive Language Development Teaching.
6. The production of two books, one on Developmental Sentence Analysis and the other on Interactive Language Development Teaching.
7. The production of two demonstration films, one on Language Development Analysis and the other on Language Development Teaching.
8. The development of contrasting clinical language and teaching techniques utilizing operant and programmed procedures.
9. The dissemination of information arising from various segments of the study.

The following discussion reports the activities and accomplishments in pursuing each of these goals:

1. The Addition of the Two-year-old Data

In order to extend the normative data downward to 2-0, five boys and five girls at each three-month age interval between 2-0 and 2-11 were added to the list of subjects. All were from middle-income homes where standard American dialect was spoken and all demonstrated an IQ equivalent within the normal range on the Peabody Picture Vocabulary Test. Thus, these children met the same subject requirements as did the other children in the DSA study. The same interviewing situation was used with these children, the stimulus materials including selected toys, pictures, and story-telling with The Three Bears. As had been anticipated, the two-year-old group was only moderately interested in the story, somewhat interested in the pictures, but greatly interested in the toys; therefore, their language samples included more utterances elicited by toys than by any of the other materials. Since two-year-old children are not usually assembled as a group, these subjects had to be located one by one, and local community groups were helpful in supplying the names of potential subjects. The children were recorded in their homes at play with the interviewing clinician, who was introduced as an old family friend. In the lowest age group, 2-0 to 2-2, eight children had to be discarded until the requirement of five boys and five girls was met, because they either would not talk to the clinician or could not be understood sufficiently. Thus, the data from this youngest age group may be slightly up-graded in comparison to the other age groups.

The DSA data from children 3-0 to 6-11 included fifty consecutive, intelligible, different, nonecholalic sentences, but since the two-year-olds were not all speaking in sentences, this procedure had to be modified. The language samples from the two-year-old group included one-hundred consecutive, intelligible, different, nonecholalic utterances, whether they were in sentence form or not. Thus, the language samples yielded data which could be classified on the DST pre-sentence chart as well as sentences which could be scored by the DSS scoring system. A DSS score was given to whatever number of sentences the children produced, and this varied from about 15 to 85. In this respect, the DSS scores of the two-year-old group were not entirely comparable to those of the other DSA children, but even so, they revealed the same developmental trends that would have been predicted from the data of the older children.

The classification of pre-sentence utterances presented some problems and required some arbitrary decisions. Interjections were considered single-word utterances even though they were followed by other words, and they were separated out and classified separately. The same decision was made regarding question morphemes (OK? huh? right?) and sentence tags (I mean, you know, I think). A sharp distinction had to be made between utterances which would be classified as pre-sentences and those that would be scored as sentences, and the decision was that a sentence must have at least a subject and verb in proper grammatical relationship. This meant that the common elliptical comments found in conversational speech (Where are you going? Home.) had to be classified as pre-sentences even though the speaker might have been able to formulate complete sentences had the conversation required it. By classifying all ellipses as pre-sentences, the clinician can gain some information as to the child's spontaneity and willingness to initiate conversation since an abundance of pre-sentences would indicate that the clinician had introduced the topics herself.

On the basis of the two-year-old data, the Developmental Sentence Types (DST) chart was revised and refined (Chart 1). The horizontal classification separates single-word utterances, two-word combinations, and multiword constructions, thus giving some evaluation of Mean Length of Utterance (MLU). This is an important measure up to three words, after which the development of grammatical structure becomes the more important measure. Table 1 shows the downward flow on the DST chart, the older two-year-olds producing fewer single words, two-word combinations, and multiword constructions and more complete sentences than did the youngest age groups.

Table 1. Mean number of utterances and standard deviations at each DST level in the language samples of forty normally-developing children by three-month age groups.

C.A.	Single words		Two-word combinations		Constructions		Complete sentences		Total utterances
	No.	SD	No.	SD	No.	SD	No.	SD	
2-0 to 2-2	18	9.57	21	7.08	18	6.17	43	15.30	100
2-3 to 2-5	19	10.03	17	6.44	18	6.67	46	14.53	100
2-6 to 2-8	19	12.03	16	9.95	16	9.19	49	23.37	100
2-9 to 2-11	14	6.29	12	5.55	16	3.65	58	11.06	100

The vertical classification of the DST chart separates noun phrases, which must be incorporated into other sentence structures, and three types of emerging sentences: the designative, predicative, and subject-verb sentences. Another vertical column classifies fragments, which contain neither the subject nor the verb of the emerging sentence. Since the variety of sentence types is an important measure for clinical children, the two-year-old data can be used as norms against which the performances of clinical children can be compared. Table 2 indicates the percentages of pre-sentences which were classified in each of the vertical DST columns:

Table 2. Percentage of utterances in each of the five DST sentence types in the language samples of forty normally-developing children by three-month age groups.

C.A.	Noun phrase	Designative	Predicative	Verbal	Fragment
2-0 to 2-2	31%	13%	17%	23%	16%
2-3 to 2-5	37%	11%	12%	27%	13%
2-6 to 2-8	40%	9%	12%	23%	16%
2-9 to 2-11	34%	9%	8%	25%	24%

Chart 1

DEVELOPMENTAL SENTENCE TYPES

SINGLE WORDS

NOUN	DESIGNATOR
car Daddy kitty-cat truck Mommy Santa Claus cookie girl hot-dog Basic sentence elaborations: Plural: books, cars, men Basic sentence modifications: Pronoun: me, something, nobody Question: book?, car?, truck (right?)	here, there this, that it Basic sentence elaborations: Plural: those, these Basic sentence modifications: Question: this?, that?, here?, there?

2-WORD COMBINATIONS

NOUN ELABORATION	DESIGNATIVE ELABORATION
Noun phrase Article: a car, the truck Possessive: Daddy car, Billy truck Quantifier: more car, other truck, two boy Adjective: big car, dirty truck, red shoe Attributive: baby bear, police car Basic sentence elaborations: Plural: the cars, more trucks Additive: car truck, Mommy Daddy Adverb: now car, truck too, car again Subject-object: doggie bone, Daddy ball Subject-locative: car garage, Mommy window Basic sentence modifications: Pronoun: this one, my truck, her cookie Negative: not car, not truck, not this Question: a car?, another truck (OK?) Wh-question: what car?, which one? Conjunction: and car, and truck, and this	Designator + noun here car, there truck, this car, that truck it car, it truck Basic sentence elaborations: Plural: these cars, there trucks Adverb: (that again = noun + adverb) (there now, here again = fragments) Basic sentence modifications: Pronoun: here something, there one Negative: (not this = noun + negative) (not here, not there = fragments) Question: that truck?, this car (right?) Wh-question: what this?, who that? Conjunction: (and this = noun + conj.) (and here, and there = fragments)

CONSTRUCTIONS

Noun phrase my big car, some more truck, a red box Noun phrase + prepositional phrase the car in front, the spot on the floor Quantifier + prepositional phrase all of them, some of the other cars Basic sentence elaborations: Plural: some other cars Adverb: now the car, the other truck too Additive: the car the truck Subject-object: the doggie another bone Subject-locative: the car the garage Basic sentence modifications: Pronoun: his other truck, all of mine Negative: not the car, not that one Question: the other car?, the boy too (huh?) Wh-question: what big car?, which other one? how much milk?, how many cookies? how about that one?, what about me? Conjunction: and the car, car and truck	Designator + noun phrase here another car, there a truck this a red car, that my truck it a big car, it my truck Basic sentence elaborations: Plural: here some cars, these big cars Adverb: there car too, here car now Additive: there Mommy Daddy Basic sentence modifications: Pronoun: that somebody car, here his car Negative: that not car, this not a truck Question: that a car?, this a car (right?) Wh-question: who that boy?, what that one? Conjunction: here a car and truck

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Chart 1 (con't)

DEVELOPMENTAL SENTENCE TYPES

DESCRIPTIVE ITEM

big, pretty, broken, fixed
one, two, more
on, off, up

Basic sentence elaborations:
None

Basic sentence modifications:
Pronoun: my, his
Question: red?, big (huh?)

VERB

sleep, eat, walk, fall
(look, lookit, wait, stop = imperative sentence)

Basic sentence elaborations:
Verb elaboration: going, fell

Basic sentence modifications:
Negative: can't, won't
(don't = imperative sentence)
Question: see?, eat (OK?)

VOCABULARY ITEM

yes, no, OK, sh, hey, hi
bye-bye, night-night, oh-oh

Basic sentence elaborations:
Adverb: again, now, too

Basic sentence modifications:
Question: huh?, right?, OK?
Wh-question: what?, who?
where?, when?, how?, why?
Conjunction: because

PREDICATIVE ELABORATION

Noun + descriptive item
car broken, truck dirty
light off, TV on
car there, truck here

Basic sentence elaborations:
Plural: cars here, lights on

Basic sentence modifications:
Pronoun: that pretty, it big
something here, another on
Question: car broken?
it gone (right?)
Wh-question: where car?
what here?, who there?

VERBAL ELABORATION

Verb + object: hit ball
Verb + locative: sit chair
Verb + particle: fall down
(Noun + verb = sentence:
baby sleep, that go, it fall)

Basic sentence elaborations:
Verb elaboration: saw car
Plural: eat cookies, see cars
Adverb: eat now, fall too

Basic sentence modifications:
Pronoun: see it, find one
Negative: not fall, can't go
Question: see it?, go home?
Wh-question: where go?
what take?, what find?
(who go?, what come? = sentence)
Conjunction: and sleeping
Infinitive: wanna go, gonna go

FRAGMENTS

Basic sentence elaborations:
Prepositional phrase:
for Daddy, in car
Plural: on chairs, in cars
Adverb: too big, all gone
up now, here again,
right here, over there

Basic sentence modifications:
Pronoun: to you, in it
Negative: not big, not here
Question: in here?
all gone (huh?)
Conjunction: and big,
) but dirty, and here

Noun phrase + descriptive item
the car broken, a truck dirty
this light off, the TV on
other car there, a truck here
car in garage, hat on head
Spot a good dog, you bad boy

Basic sentence elaborations:
Plural: all cars broken
Adverb: light off now
car here too, truck too dirty
Double locator: car over there

Basic sentence modifications:
Pronoun: he bad boy, it off now
Negative: this not broken
Question: it off now?
car over there (huh?)
Wh-question: where that one?
who in car?, what color car?
what in here?
Conjunction: car and truck here

Verb + object: eat the cookie
Verb + locative: put the table
Verb + particle + noun:
take off hat, turn on light
(Noun phrase + verb = sentence
the car go, a boy eat)

Basic sentence elaborations:
Verb elaboration: goes in barn
Adverb: see car now, go in too

Basic sentence modifications:
Pronoun: want it now
Negative: not fall down
Question: see that one?
eat more cookies (OK?)
Wh-question: where put car?
what take out? what find here?
what doing to car?
Conjunction: and find car
Infinitive: wanna see it
gonna go home, gotta find it

Words in series:
1, 2, 3, 4, etc.
dog, cow, pig, etc.

Basic sentence elaborations:
Prepositional phrase:
in the car, for the boy
Plural: on the chairs
Adverb: in car too,
back over there

Basic sentence modifications:
Pronoun: on my head
Negative: not in it
Question: in here too?
in the car (right?)
Conjunction: and for me

The DST chart also provides for an internal evaluation of grammatical structure within each of the classification boxes. Those utterances showing basic sentence elaboration (plurals, adverbs, verb elaboration, etc.) are placed lower in the box than entries which do not show such features, and utterances which show emerging sentence modification forms (pronouns, negatives, conjunctions, questions, etc.) are placed at the bottom of the box. Thus, the clinician can quickly estimate whether the child is beginning to incorporate grammatical elaboration into his spontaneous speech even before he is speaking in complete sentences. The two-year-old data were analyzed for this type of grammacical development, as is shown in Table 3.

Table 3. Percentage of DST pre-sentence utterances containing grammatical elaborations in the language samples of 40 normally-developing children by three-month age groups.

C.A.	Percentage of pre-sentences grammatically elaborated
2-0 to 2-2	27%
2-3 to 2-5	32%
2-6 to 2-8	33%
2-9 to 2-11	44%

The two-year-old data also allowed an estimate of the number of sentences per one-hundred utterances which normally developing children show at this stage of language development. As can be seen in Table 1, even the lowest age group, 2-0 to 2-2, were formulating 43% complete sentences, and this number had increased to 58% in the 2-9 to 2-11 age group. The DSS scores derived from these sentences must be held somewhat tentative, since the number of sentences in each language sample varied, but even so, the DSS scores of the two-year-old group followed a predictable downward trend from the scores previously derived from the three-year-old group. This will be discussed in greater detail with the presentation of the new reweighted norm chart.

2. Results of the Reciprocal Averaging Procedure

The earlier version of the DSS procedure (Lee and Canter, 1971) proposed a hypothetical developmental order of grammatical structures in each of eight categories: indefinite pronouns and noun modifiers, personal pronouns, main verbs, secondary verbs, negatives, conjunctions, interrogative reversals, and wh-questions. However, the earlier DSS did not compare development across categories; it merely scored in serial order the hypothesized sequence of development within each category. With the accumulation of data on two-hundred language samples, it was possible to subject the spontaneous sentences to the statistical treatment known as reciprocal averaging, yielding a revised scoring system that could be interpreted across categories. The revised DSS verified the developmental order which had been hypothesized with three exceptions. Both passive main verbs and passive infinitives were up-graded one point and the negative on auxiliary *have* was likewise up-graded. Since the DSS was intended to be a guide for the presentation of grammatical structure in clinical teaching as well as in evaluation, and since the passive should be a relatively late teaching goal, the passive structures were returned to their former location in the developmental sequence. The auxiliary-*have* with negative had appeared so infrequently in the data that it was felt it, too, should be placed as a later-appearing form. Therefore, the reweighted DSS retains the same sequential order in each grammatical category as was hypothesized at the outset. However, the weighted scores now reflect across-category comparisons and have resulted in a new Developmental

Sentence Scoring chart (Chart 2). The revised DSS chart can now be interpreted horizontally as well as vertically, and a clinician can estimate what pronouns, verb forms, negatives, conjunctions, and questions should be making their appearance in children's spontaneous speech at about the same time. Thus, it provides a guide for programming clinical teaching goals as well as affording a diagnostic evaluation of children's syntactic development.

3. Statistical Analysis of the DSA Data

A detailed statistical analysis is given elsewhere in this report, but a briefer discussion is appropriate here as an indication of the clinical usefulness and application of the DSA findings. With the revised scoring system, produced by reciprocal averaging, all the language samples were re-scored and new normative information was produced. Means and selected percentiles were computed for each age group so that they could be illustrated on the revised chart of DSS norms (Chart 3). One-year age groups were used for the children ages 3-0 to 6-11, but for the presentation of the two-year-old data, six-month age groups were separated. The rate of language growth is so rapid at this early stage, and it is such a crucial stage for the comparison of clinical children that the more refined treatment of the data by six-month age groups was warranted. Furthermore, a hypothetical mean was established for children below the age of 2-0 on the assumption that syntactic development begins for most children at about 18 months of age with the appearance of two-word combinations. Therefore, the 50th percentile line was extended downward on the norm chart from the verified mean of 3.10 for children 2-0 to 2-5 to a hypothesized zero at 18 months. Even though this information is not verified by the DSA data, it provides a useful measure for evaluating clinical children who have not reached a two-year-old level of language development.

The DSS chart of norms is useful in several ways to speech and language clinicians. By locating an individual child's chronological age and his DSS score at a point on the chart, the clinician can see at a glance into what percentile he falls compared to other children of his age group. She can see quickly whether he is sufficiently below the 10th percentile line to warrant further investigation or whether he is within normal limits in regard to syntactic development. Furthermore, a clinician can keep a record of a child's progress and improvement during the period of clinical teaching by plotting successive DSS scores on the chart of norms. Such a record of periodic language sampling would show whether a child is closing the gap between himself and the children in his chronological age group. Such information would be useful in deciding at what point to terminate clinical teaching.

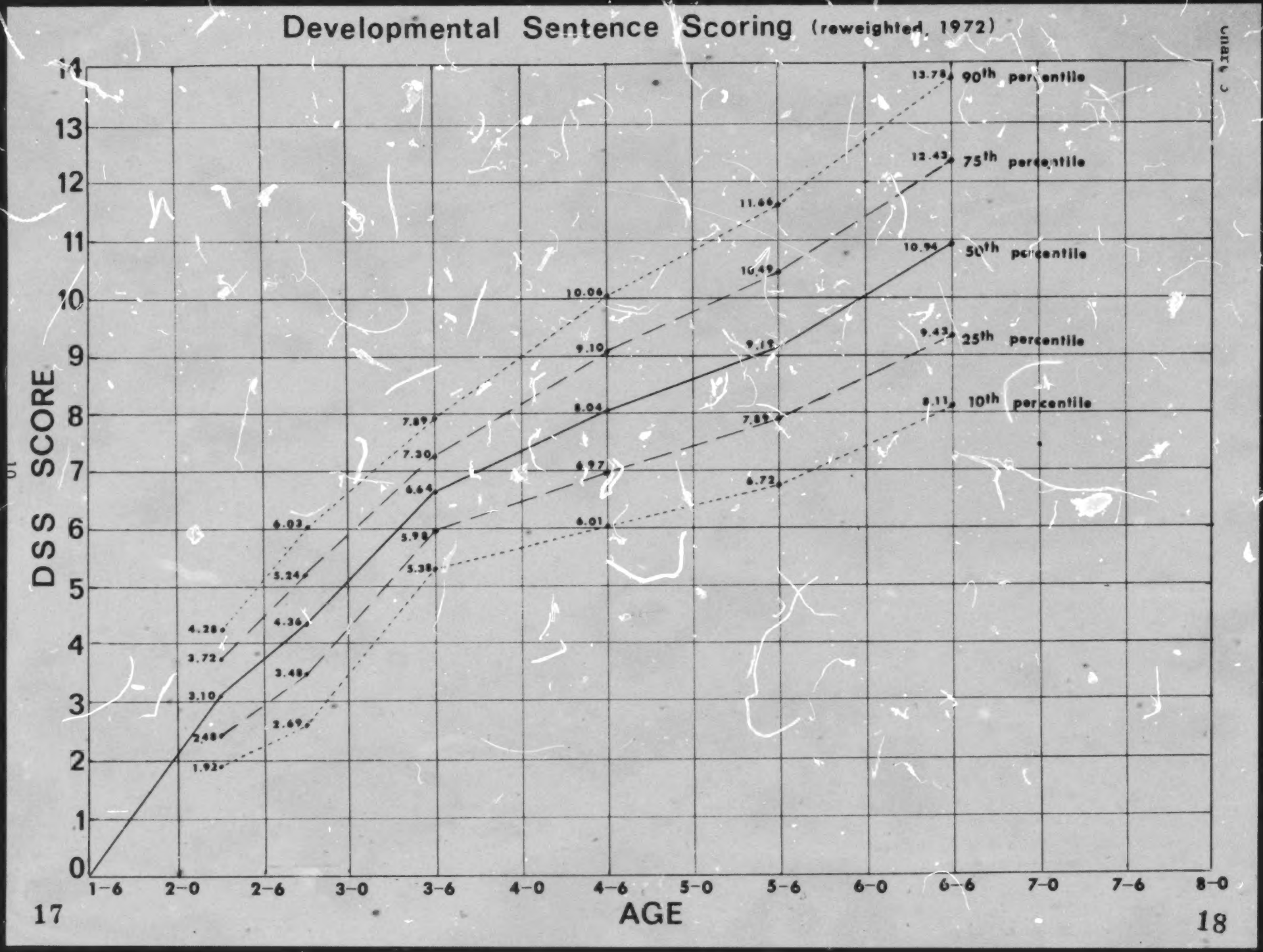
Another use of the DSS norm chart is to estimate a child's language performance in terms of the mean for a lower age group. Thus, a clinician could report that an individual child of 3-6 had received a score equivalent to the average child of 2-6, thus estimating him to be a year delayed by the DSS measure. Furthermore, by estimating a child's language age in terms of a lower age group on successive applications of the DSS procedure, a clinician can judge his rate of progress in comparison to children at his same stage of language development. If such a child moved from a 2-6 language level to a 3-6 language level in less than 12 months of clinical teaching, then the clinician could feel confident that the teaching had been effective. The DSS chart of norms provides this important means for determining teaching effectiveness and can be used to compare the relative effectiveness of different teaching techniques. Speech and language clinicians have long needed some way of justifying their professional activities and of demonstrating that their clinical intervention has produced results that "nature" or "maturation" alone would not have produced. If it can be shown that clinical children, who were slow to begin talking in the

DEVELOPMENTAL SENTENCE SCORING (Revised, 1972)
Laura L. Lee and Roy A. Koenigsknecht
Northwestern University
Copyright, 1972

	INDEFINITE PRONOUNS OR NOUN MODIFIERS	PERSONAL PRONOUNS	MAIN VERBS	SECONDARY VERBS
1	it, this, that	1st and 2nd person: I, me, my, mine, you, your(s)	A. Uninflected verb: I see you. B. copula, is or 's: It's red. C. is + verb + ing: He is coming.	
2		3rd person: he, him, his she, her, hers	A. -s and -ed: plays, played B. Irregular past: ate, saw C. Copula: am, are, was, were D. Auxiliary am, are, was, were	Five early-developing infinitival complements: I wanna see (want to see) I'm gonna see (going to see) I gotta see (got to see) Lemme [to] see (let me [to] see) Let's [to] play (let [us to] play)
3	A. no, some, more, all, lot(s), one(s), two (etc.) other(s), another B. something, somebody, someone	A. Plurals: we, us, our(s) they, them, their B. these, those		Non-complementing infinitives: I stopped to play. I'm afraid to look. It's hard to do that.
4	nothing, nobody, none, no one		A. can, will, may + verb: may go B. Obligatory do + verb: don't go C. Emphatic do + verb: I do see.	Participle, present or past: I see a boy running. I found the toy broken.
5		Reflexives: myself, yourself, himself, herself, itself, themselves		A. Early infinitival compliments with differing subjects in kernels: I want you to come. Let him [to] see. B. Later infinitival complements: I had to go. I told him to go. I tried to go. He ought to go. C. Obligatory deletions: Make it [to] go. I'd better [to] go. D. Infinitive with wh-word: I know what to get. I know how to do it.
6		A. Wh-pronouns: who, which, whose, whom, what, that, how many, how much I know who came. That's what I said. B. Wh-word + infinitive: I know what to do. I know who(m) to take.	A. could, would, should, might + verb: might come, could be B. Obligatory does, did + verb C. Emphatic does, did + verb	
7	A. any, anything, anybody, anyone B. every, everything, everybody, everyone C. both, few, many, each, several, most, least, much, next, first, last, second (etc.)	(his) own, one, oneself, whichever, whoever, whatever Take whatever you like.	A. Passive with get, any tense Passive with be, any tense B. must, shall + verb: must come C. have + verb + en: I've eaten D. have got: I've got it.	Passive infinitival complement: With get: I have to get dressed. I don't want to get hurt. With be: I want to be pulled. It's going to be locked.
8			A. have been + verb + ing had been + verb + ing B. modal + have + verb + en may have eaten C. modal + be + verb + ing could be playing D. Other auxiliary combinations: should have been sleeping	Gerund: Swinging is fun. I like fishing. He started laughing.

Chart 2 (con't)

NEGATIVES	CONJUNCTIONS	INTERROGATIVE REVERSALS	WH-QUESTIONS
it, this, that + copula or auxiliary is, 's, + not: It's not mine. This is not a dog. That is not moving.		Reversal of copula: Isn't it red? Were they there?	
			A. who, what, what + noun: Who am I? What is he eating? What book are you reading? B. where, how many, how much, what...do, what...for Where did it go? How much do you want? What is he doing? What is a hammer for?
	and		
can't, don't		Reversal of auxiliary be: Is he coming? Isn't he coming? Was he going? Wasn't he going?	
isn't, won't	A. but B. so, and so, so that C. or, if		when, how, how + adjective When shall I come? How do you do it? How big is it?
	because	A. Obligatory do, does, did: Do they run? Does it bite? Didn't it hurt? B. Reversal of modal: Can you play? Won't it hurt? Shall I sit down? C. Tag question: It's fun, isn't it? It isn't fun, is it?	
All other negatives: A. Uncontracted negatives: I can not go He has not gone. B. Pronoun-auxiliary or pronoun-copula contraction: I'm not coming. He's not here. C. Auxiliary-negative or copula-negative contraction: He wasn't going. He hasn't been seen. It couldn't be mine. They aren't big.			why, what if, how come how about + gerund Why are you crying? What if I won't do it? How come he is crying? How about coming with me?
	A. where, when, how while, whether (or not), till, until, unless, since, before, after, for, as, as + adjective + as, as if, like, that, than I know where you are. Don't come till I call. B. Obligatory deletions: I run faster than you (run) I'm as big as a man (is big) It looks like a dog (looks) C. Elliptical deletions (score 0) That's why [I took it] I know how [I can do it] D. Wh-words + infinitive: I know how to do it. I know where to go.	A. Reversal of auxiliary have: Has he seen you? B. Reversal with two or three auxiliaries: Has he been eating? Couldn't he have waited? Could he have been crying? Wouldn't he have been going?	whose, which, which + noun Whose car is that? Which book do you want?


Developmental Sentence Scoring (reweighted, 1972)
DSS SCORE
AGE
90th percentile
75th percentile
50th percentile
25th percentile
10th percentile
13.78
12.43
11.66
10.94
10.49
10.06
9.43
9.19
9.10
8.11
8.04
7.89
7.89
7.30
6.97
6.72
6.64
6.03
6.01
5.98
5.38
5.24
4.36
4.28
3.72
3.48
3.10
2.69
2.48
1.92
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1-6
2-0
2-6
3-0
3-6
4-0
4-6
5-0
5-6
6-0
6-6
7-0
7-6
8-0

first place, can be led through the developmental stages at a faster rate than one would normally expect, then it would seem that clinical effectiveness had been demonstrated. The DSS procedure and its accompanying chart of norms can yield this information.

4. Interactive Language Development Teaching

At the same time that the study of developmental syntax was leading to the refinement of the DSA procedures, the Northwestern University Speech and Language Clinics had been exploring various teaching techniques which would present grammatical structures to clinical children in developmental steps. It was hoped that a new teaching approach could avoid the extremes of simple, unstructured language stimulation and the highly structured, sometimes rigid, procedures of behavior modification. The psycholinguistic literature had reported very little in the way of teaching procedures since these investigations were concerned largely with the language acquisition of normally developing children, who need no formal language teaching at all. Cazden (1965) had discussed the techniques of "expansion" and "modeling" in her study of Head Start children and McNeill (1971) had emphasized the importance of a "contiguity" between the semantic intentions which a child had in mind and the grammatical structures which parents produced. Other investigations of children's language acquisition (Bloom, 1970; Brown and Bellugi, 1964; Miller and Ervin, 1964) had indicated that language development took place in the interaction between parent and child, talking together about the common, everyday experiences and on-going events of daily living. Thus, a rationale for language intervention with clinical children might capitalize on this conversational interchange and might try to replicate parent-child interaction in a clinical setting. Since interesting conversations cannot be contrived to occur "on command" within a designated clinical session, story-telling seemed an appropriate substitute. Simple stories could be written with the proper control of developmental grammatical structures and could be interspersed with questions which would elicit spontaneous speech from the children. With a very simple story plot and a few visual flannel-board materials, the semantic content of grammatical structures would be heightened far beyond that of repetitive drill material. The children would be engaging in both receptive and expressive language at their own developmental level, and they would be formulating language, not merely imitating it. Thus, the conversational setting of normal language acquisition could be approximated in a speech and language clinic.

One question which the present grant has allowed us to explore has been whether student clinicians at the Master's degree level could be taught to write and present language development stories for interactive teaching. Over the three-year grant period 75 graduate student clinicians have participated in the preparation and presentation of language stories and have demonstrated that with proper instruction the technique can be easily learned. Many of them have continued to use what has come to be known as Interactive Language Development Teaching following their graduation from the university program. This procedure involves (1) setting appropriate teaching goals for individual children from successive DSA evaluations, (2) writing appropriate language stories, interspersed with questions which elicit the target structures the child is learning, (3) employing a variety of prompting techniques by which children's elicited speech can be shaped to more closely approximate the target structures, and (4) evaluating one's own effectiveness as a clinical teacher. Interactive Language Development Teaching seems to provide a middle-of-the-road procedure between unstructured language stimulation and purely imitative drill.

One very original aspect of Interactive Language Development Teaching has been the development of a set of prompting techniques by which children are

asked to rephrase, reformulate, or expand their original answers to the questions within the story. These prompts are listed in the order in which they offer most-to-least help to the child:

Stimulus question: the original question which elicits the target response.
Complete model: the clinician repeats again the target response.
Reduced model: the clinician repeats only part of the target response.
Expansion request: the clinician asks a child to "say the whole thing."
Repetition request: the clinician asks a child to "say it again."
Repetition of error: the clinician repeats the child's attempt at the target structure to see if he will correct her.
Self-correction request: the clinician asks the child whether he said the target structure correctly or not.
Rephrased question: the clinician repeats the initial stimulus question without any further helping clues.

An Interchange Chart has been worked out whereby observers can chart the clinician's successful or unsuccessful use of a variety of prompting techniques. This kind of evaluation of clinician effectiveness can be done from an observation room or by the clinician herself from a videotape of the lesson. The clinician can discover whether she was relying on only a few of the many possible prompting techniques or whether she was applying them in an appropriate order to afford the child the maximum learning experience. The Interchange Chart has been extremely beneficial in the training of student clinicians and they have become competent in evaluating and perfecting their own teaching effectiveness.

5. A Three-year Study of Developmental Sentence Analysis and Interactive Language Development Teaching

A topic of great professional interest and concern at the moment is that of clinician "accountability," the degree to which clinicians can establish the success and effectiveness of their clinical procedures. In short, clinical teaching must show results, and these cannot be measured by judgment alone. One problem in demonstrating such results has been that we cannot ethically use control groups; we cannot withhold clinical training from any child whom we think needs it and will gain by it. Therefore, we cannot train one group of children and withhold training from a comparable group in order to show that the training has produced results. However, with the DSA normative data we now can compare the progress of clinical children with the rate of progress of normally developing children who are at their same stage of language development. We can estimate a clinical child's language gain in months and can compare it to the number of months' training required to produce it. Since clinical children have been slow to begin language development, it might be supposed that their rate of progress would also be slower than that of a normally developing child. If clinical training could produce a rate of gain equal to that of normal children, or even surpassing it, the clinician could feel confident that her teaching had been effective and that her "accountability" had been established.

The three-year continuing study of language development training was designed to investigate this question. Twenty-five language cases were followed closely during this period although no child stayed in the program during the entire three years. A pre-enrollment DSA revealed the language level at which the child was functioning and repeated DSA language samples were taken at three-month intervals. Thus, teaching goals could be up-graded and modified to meet the individual needs of each child. The final DSA, taken just before dismissal from the program, was considered to be his level of language functioning at the end of treatment, even if it proved to be a lower score than he had reached in a previous testing period. While a detailed statistical analysis of this material

is given elsewhere in this report, it is appropriate to state here that, as a group, the clinical children exceeded the normal rate of language growth; that is, their average language gain, estimated in months, was greater than the number of months spent in clinical training. These results seem to point to the effectiveness of clinical intervention with children with slow language development and to establish an accountability for speech and language clinicians.

6. Publications Growing out of These Investigations

Two publications were written into the grant application and both of them are now in the hands of the publishers, Northwestern University Press. By terms of the contract, the royalties will be divided evenly between the U. S. Office of Education and Northwestern University, the grantee. The copyright period is for seven years, terminating in 1981, at which time they pass into the public domain.

The first publication is Developmental Sentence Analysis: A Grammatical Assessment Procedure for Speech and Language Clinicians by Laura L. Lee with a chapter by Roy A. Koenigsknecht. This book provides a detailed chapter on background information on grammatical structure, giving the developmental steps of normal grammatical development and the clinical problems in atypical development for each level of grammar it discusses. Both the Developmental Sentence Types and the Developmental Sentence Scoring procedures are discussed in great detail, accompanied by many illustrative language samples from both clinical and normally developing children. Another chapter explains how language teaching goals are derived from the analysis of a language sample, and this is illustrated by a discussion of a particular language sample of a clinical child. A chapter is devoted to a comparison of the DSA data with the findings of Roger Brown (1973) and points of similarity between the two studies are explored and evaluated. A final chapter by Roy A. Koenigsknecht presents the detailed statistical analysis of the DSA material.

The second publication is Interactive Language Development Teaching: The Clinical Presentation of Grammatical Structure by Laura L. Lee, Roy A. Koenigsknecht, and Susan T. Mulhern. This book explains in detail the clinical approach to language development teaching which grew out of the DSA studies. Explicit directions are given for the writing of language development stories, for their presentation to clinical children, and for the evaluation of clinician effectiveness in administering the lessons. The book also contains thirty sample stories for children at a beginning level of language development and thirty-two stories for more advanced children. The stories are not intended to be a workbook to be followed indiscriminately, but rather as examples of the kinds of stories which clinicians can compose prescriptively for individual children or groups of children. Language goals are carefully set out at the beginning of each story so the clinician can see what structures are being emphasized. Target responses are set in a separate column and are scored by the DSS reweighted scores to illustrate the increase in grammatical load of the later sessions. A final section gives a statistical analysis of the use of Interactive Language Development Teaching during the three-year study at the Northwestern University Speech and Language Clinics. The DSA language samples of the clinical children on pre- and post-training evaluations are shown to reveal a language gain which surpasses the rate of normal language development.

7. Films Growing out of These Investigations

Two teaching films are being produced, as specified in the grant application, and both of them are nearing completion. All the filming is done; only editing

and narration remain to be completed. The films will be available for rental or purchase from the Northwestern University Film Library, which is affiliated with Northwestern University Press. Royalties will be divided equally between the U. S. Office of Education and Northwestern University as grantee.

The first film is Developmental Language Analysis: A Demonstration Film by Roy A. Koenigsknecht, Susan T. Mulhern, and Laura L. Lee. The DSA procedure is both discussed and illustrated by the filming of a child whose spontaneous speech is being recorded for a language sample. The viewer can easily see how conversational speech is elicited, what stimulus materials are used, and how the language sample is selected from the tape-recording. Narration and charts are interspersed to show the details of the DST classification system and the DSS scoring procedure. It is expected that this film will make a useful classroom teaching aid and will be an accompaniment to the Developmental Sentence Analysis book.

The second film is Developmental Language Teaching: A Demonstration Film by Roy A. Koenigsknecht, Susan T. Mulhern, and Laura L. Lee. In this film the conversational approach to clinical language teaching is both discussed and illustrated by short segments of several language development sessions. The viewer can observe the pace of the story presentation, the use of prompting techniques appropriate to individual children, the success of the clinician in eliciting closer approximations to the target structures, and the general attitude and interest of the children in the lesson material. Through narration the rationale for Interactive Language Development Teaching is explained and the segments of language sessions are evaluated. This film should be of benefit both to students in training and to clinicians already engaged in professional work, as an introduction to a new approach to language teaching.

8. Application of Operant and Programmed Procedures

A construct for group oral language remediation with children demonstrating atypical syntax was devised utilizing operant and programming procedures. A comprehensive organizational plan based upon (a) DSA, (b) information on normal language acquisition, and (c) operant and programming procedures, was developed yielding a treatment program for individualized child language remediation presented in a group format. This treatment construct maximizes the number of correct productions elicited per child in small, carefully graded steps of progressive difficulty. It efficiently outlines the process of mastery necessary for the child to develop facility syntactically with designated target structures. The specific techniques of behavior modification considered were: systematic stimulus presentation and manipulation, graded response sequences; response shaping and manipulation; reinforcement principles; and extension of stimulus control. Consistent with these factors, two major areas of task difficulty requiring planning and consideration in developing the treatment construct were (a) the stimulus complexity or syntactic maturity of the forms, and thus the receptive task required of the child-client, and (b) the response complexity and therefore the expressive demands placed upon the child's performance. The verbal stimuli are planned under four major phases of a stimulus sequence including the (a) presentation, (b) establishment, (c) formulation, and (d) generalization. These are discussed in a later section of this report. The results of a preliminary application of the construct treatment are also discussed.

9. Dissemination of Information

Each of the progress reports during the three-year funding period of this project has listed the dissemination activities of the participants; therefore,

they need only to be briefly summarized here. Numerous papers have been presented at the conventions of the American Speech and Hearing Association, and some of these will be submitted for publication, following the publication of the two books which have been produced under this grant. Various workshops and short courses have been presented at a number of state speech and hearing associations, and regional groups of public school speech clinicians. These include Massachusetts, North Carolina, Iowa, Illinois, Virginia, Washington, Nevada, Pennsylvania, California, District of Columbia, and Wisconsin.

Workshops and seminars have been presented at various universities in the United States, and these include the following: Tulane University, Ohio State University, George Washington University, Southwest Texas State University, Southern Methodist University, University of Wisconsin, Purdue University, Florida State University, University of Hawaii, University of Wisconsin - Eau Claire, Western Washington State College, Texas Christian University, Idaho State University, University of Nebraska, and University of Wisconsin - Stevens Point.

Several appearances have been made at international conferences and conventions or at meetings of speech and language clinicians in countries other than the United States. These include the following: Denmark, the Danish Association for Logopedics; Sweden, University of Stockholm and Sabbatsbord Hospital; Australia, the Australian College of Speech Therapists; Canada, Ontario Speech and Hearing Assocation and the University of Manitoba.

Several appearances by project participants are scheduled for future dates, some of them in the United States and some of them of an international nature. These include the following: Interlaken, Switzerland, The International Association of Logopedics and Phoniatrics, August, 1974. An invited paper will be presented and will be published prior to the conference in Folia Phoniatrica. University of Leeds, England, The British College of Speech Therapists, September, 1974. A speech will be given to the convention of this association. Austin, Texas, the speech therapists of Region XIII, April, 1974. A two-day workshop will be given to this group. Las Vegas, Nevada, The American Speech and Hearing Association, November, 1974. Proposals are being submitted for a short course by the participants in this grant project and the films are being recommended for showing at the film theater.

It is expected that the dissemination of information arising from this project funded by the U. S. Office of Education will continue for a long time. The material which it has produced appears to be statistically sound, clinically applicable, and professionally useful. The project directors intend to continue not only their dissemination activities but also their investigation of other aspects of clinical language problems which have emerged as a result of these studies. In reviewing the goals which the grant application set at the beginning of the funding period, it appears that all of them have been accomplished.

SECTION II

STATISTICAL INFORMATION ON DEVELOPMENTAL SENTENCE ANALYSIS

Anyone dealing with young children in an educational or clinical setting has practical use for normative data on the acquisition of syntax and morphology and for data on the interrelationships among sentence structures. Attempts to quantify or scale grammatical aspects of oral language during developmental periods are legion. There still exists, however, a well recognized need for valid and reliable clinical and research methods for the assessment of children's spontaneous oral language usage. In any area of study, physical, social, or behavioral, as the measuring techniques and procedures are improved it is possible to extend and refine knowledge in that area. Developmental Sentence Scoring (DSS) and Developmental Sentence Types (DST) as scales of syntax acquisition and practical procedures for the analysis of normal and deviant grammar are proving to be useful tools for refining and enhancing information on normal and atypical spontaneous language usage. The purpose of this section is to provide statistical information on the techniques of Developmental Sentence Analysis (DSA). This information is presented in five parts.

The first part includes a discussion of the procedures and findings for the cross-sectional study of DSS language samples from two hundred children between the ages of 2-0 to 6-11 years used in establishing the normative data base for the instrument. Developmental patterns underlying the acquisition of syntax are detailed. The internal consistency of the DSS procedure is considered in the second part. The stability of the scoring system is treated through coefficient alpha correlation coefficients and split-half reliability estimates. The third part of this chapter dealing with item analyses of the DSS procedure, is vital to full interpretation of the first two and concerns category-total correlations, intercategory correlations, and analyses of the individual grammatical categories. Studies of four variables thought to influence the clinical usefulness of the DSS technique are presented in the fourth part. These are: interviewing-clinician differences, stimulus material differences, temporal reliability, and sentence sequence effects. The final part is devoted to differences in the development of syntax in male and female children.

NORMATIVE DATA ON THE DSS

Those working to provide useful scales and measures for quantifying and analyzing developmental aspects of language usage must consider the massive assumption that the numbers and chartings they obtain with their instruments are isomorphically related to actual child language. Central to such an assumption are questions concerning the validity and reliability of the measures involved.

The validity of a test of language behavior cannot be proven directly. Efforts to document the face validity of a test generally take the direction of assessing its agreement with other tests. The obvious problem in studying the DSS, for example, as a more comprehensive, objective measure of a child's spontaneous use of syntactical structures and morphological forms, is the lack of an adequate and appropriate external criterion. Necessarily, validity of the DSS scorings must in large part be indicated by significant differences produced among successive age groups of normally developing children. The internal consistency of the instrument and the consistency of measurement with repeated applications of the procedure, with different interviewing-clinicians take on added significance because of the difficulty in evaluating directly the assumed validity of such a language measure. Tests used in clinical assessment and diagnosis must have a very substantial degree

of reliability. Major, additional support for the usefulness of the DSS scoring procedure will be supplied by the high reliability coefficients obtained for the instrument.

Procedures for Cross-sectional Study

Subjects. The subject group consisted of two hundred normally developing white children between the ages of 2-0 to 6-11 years, with five boys and five girls at each three-month interval. Thus, there were twenty boys and twenty girls in each of the five one-year age groups. All the children were from monolingual homes where standard English of general American dialect was spoken. Subjects resided in Illinois, Maryland, Michigan, or Kansas.

All except three subjects came from the middle-income families as scaled on the basis of fathers' occupations, ratings three, four, and five on the seven-point Warner scale for rating occupations (Warner, Meeker, and Eells, 1949, p. 140). These authors reported that occupation rating was the most powerful single status characteristic for assigning social-class placement (p. 168). Table 4 shows the classification of fathers' occupations for subjects of this study listed in one-year age groups. Ratings across the one-year age groups were similar. The mean rating of fathers' occupation for the two hundred children was 3.67. Two of the subjects obtained a rating of six, slightly below the middle-income groups, and one subject was not classifiable.

Table 4. Classification of fathers' occupations for 200 subjects

Age Group	Seven-point Rating Scale from the Warner Scale								
	1	2	3	4	5	6	7:	Unclassified	Mean Rating
2-0 to 2-11	0	0	26	5	8	1	0	0	3.60
3-0 to 3-11	0	0	21	12	5	1	0	1	3.64
4-0 to 4-11	0	0	23	11	6	0	0	0	3.58
5-0 to 5-11	0	0	19	14	7	0	0	0	3.70
6-0 to 6-11	0	0	19	8	13	0	0	0	3.35
2-0 to 6-11									

No children with unusual developmental or social histories as reported by parents, physicians, or teachers, were included in the subject group. Children with suspected hearing sensitivity problems, speech not understood by the interviewing clinician, or discernable behavior problems were excluded from the study. For the 3-0 to 6-11 year old subjects only children who scored within one standard deviation from the mean score for their age level on the Peabody Picture Vocabulary Test (Dunn, 1965, pp. 28-29) were included. Children who obtained more extreme high or low scores on this measure of receptive vocabulary for single words were eliminated. Use of the PPVT as a partial indicator of very advanced or very delayed language development with children ages 2-0 to 2-11 had to be modified because there are no PPVT norms for the lower ages. Children in the four youngest three-month intervals, (a) 2-0 to 2-2, (b) 2-3 to 2-5, (c) 2-6 to 2-8, and (d) 2-9 to 2-11, had to answer correctly, (a) at least five items, (b) at least ten items, (c) between twelve and twenty-nine items, and (d) seventeen and thirty-five items.

Interviewing clinicians. The five white interviewers, four female and one male, were speech and language pathologists at the master's degree level. All were trained in eliciting and transcribing language samples from children following the guidelines presented in Chapter 2 of Lee's Developmental Sentence Analysis, 1974.

Stimulus materials. Miniature toys and figures, sets of pictures, and a familiar nursery story were the three types of stimuli used by the interviewers to elicit conversational speech from the children. The order in which these materials are listed is the sequence in which they were presented and talked about with each of the two hundred subjects. The stimulus items were selected to interest both boys and girls. The toys and figures consisted of a small barn and farm animals, a doll family and plastic furniture, and a transport truck loaded with small cars. Eleven story-action pictures were selected from the preprimer series, We Read Pictures, We Read More Pictures, and Before We Read (Robinson, Monroe, and Artley, 1962). Pictures of The Three Bears from What's Its Name (Utley, 1950) were displayed for the children as they were encouraged to recount this familiar tale. Two-year-old subjects, as well as some of the three-year-old subjects, talked most during free play with the toys and figures, older three- and four-year-old children talked more about the action pictures, whereas many of the five- and six-year-olds most readily provided conversation while telling their version of "The Three Bears."

An attempt was made to keep the language sampling sessions as uniform as possible across all age levels. The goal of developing a useful clinical procedure led to the control of the order in which the stimulus materials were used. Thus it was not possible to study the influence of the type of stimulus material upon the subjects' grammar usage without regard to the order of stimulus presentation within a session.

In a subsequent study, to be reported in a later part of this chapter, language samples were elicited from children 4-0 to 5-6 years of age with different versions of both picture and story stimulus materials counterbalanced in order of presentation over repeated measurements. The over-all DSS scores of the subjects in the latter investigation were not significantly affected by changes in the stimulus materials.

Eliciting, recording, transcribing, and scoring of the language samples. The interviewing clinicians' task was the collection of sets of utterances that were representative of subjects' spontaneous oral language under conditions of adult stimulation. They adhered to the guidelines detailed in Chapter 2 of Lee's Development Sentence Analysis for establishing a warm conversational climate conducive to eliciting complete sentences, fulfilling the subject-verb requirements, from the children. They utilized the suggested prompts and question forms to encourage subjects to use their most highly developed syntactic structures and morphological forms. All language sampling sessions were tape recorded. The interviewing clinician transcribed the corpus making allowances for articulation errors, grammatical reformulations, non-fluencies, and word-finding difficulties as explained by Lee.

For subjects 3-0 to 6-11 years of age the last 50 sentences of the session were selected for scoring and analysis. This was in part to control for possible warm-up and general adjustment to the conversational setting. In a subsequent study to be reported in a later part of this chapter in which the order of presentation of stimulus materials was counter-balanced, subjects obtained no significant differences on the over-all DSS scores nor for any of the individual DSS grammatical categories on their later utterances in a corpus in contrast to their earlier utterances. Since normally developing children in the 2-0 to 2-11 year age group can not all

produce 50 complete sentences in a one-hour session, and many of the youngest in this age range speak largely in incomplete sentences, procedures for selecting their corpora for grammatical analysis was modified. Their last 100 different utterances within a usual one-hour session were analyzed. Incomplete and complete sentences were sorted for DST and DSS charting respectively. The complete sentence utterances were scored with the DSS procedure, whether grammatically correct or not. Eight children from the 2-0 to 2-2 year age group who could not produce 100 different utterances within an hour were not included in the study. The smallest number of DSS sentences for any two-year-old subject was 14, while the largest was 87. The mean number of DSS sentences produced by the two-year-olds in 100 utterances was 49.02 with a standard deviation of 17.00. With subjects in three-month age groups within the 2-0 to 2-11 year age period there was a progressive increase with age in the number of DSS sentences in 100 utterances. The mean number of sentences for subjects (a) 2-0 to 2-2 was 42.90 with a standard deviation of 15.30, (b) 2-3 to 2-5 was 46.40 with a standard deviation of 14.53, (c) 2-6 to 2-8 was 48.80 with a standard deviation of 23.37, and (d) 2-9 to 2-11 was 58.00 with a standard deviation of 11.05. Thus for subjects from 3-0 to 6-11 years of age, DSS scoring was based upon 50 complete, different, consecutive, intelligible, nonecholalic spontaneous sentences; for subjects in the 2-0 to 2-11 year age group this number varied but averaged 49.02. In the DSS procedure weighted scores are assigned to an acquisitional order of pronouns, verbs, negatives, conjunctions, yes-no questions, and wh-questions. Chapter 4 of Lee's Developmental Sentence Analysis, 1974, details the scoring system. Individual scores for the sentences are totaled. An additional point is included in the score for sentences which meet all adult standard rules for grammar. The mean score per sentence across all sentences within a language sample is the derived over-all DSS score. Scores for entries within each of the eight individual grammatical categories of the DSS were also analyzed.

Reciprocal averaging and reweighting the DSS. A reciprocal averaging procedure was employed in rescaling the original DSS grammatical categories which were described by Lee and Canter (1971). Specific criteria utilized in the procedure included the typical age of emerging usage of a structure or item in relation to the emergence of other structures in the same or different grammatical categories, the consistency of structure usage within 50-utterance samples, the item-total correlations, and the discrimination of structures between successive age groupings.

Reciprocal averaging is a set of statistical techniques that takes data calculated from an ordinal scale of weighted scores and reweights the data according to several possible criteria to approach, in effect, certain interval scale requirements. The analyses utilized maximize the internal consistency of a scoring system and the item-total correlations. These are important statistics in assessing the reliability and appropriateness of a measurement procedure. New scoring levels or weights are assigned to the original scaling items to maximize these statistics. The goal of developing the DSS as a language assessment tool utilizing features of an interval scale of measurement was first discussed by Koenigsknecht and Lee (1971).

In the case of a scale or test with multiple subcategories this means that the number values assigned within one hierarchical arrangement take on reference value such that these values may be equated and compared to values contained in the hierarchies of other categories. Thus the hierarchies in the system can be compared by numbers horizontally across categories. Previously these values were not directly comparable across categories and were useful only for noting relative standing within a category.

In order for the reciprocal averaging procedure to be used effectively and appropriately some initial or first-scoring reliability must be demonstrated for

the original scores. As reported by Koenigsknecht and Lee (1971) the original DSS scoring system did evidence consistency with an over-all internal consistency as estimated by Cronbach's Coefficient Alpha of 0.57 (Guilford, 1954, p. 385).

A critical finding was that the rank order of structures within all grammatical categories remained remarkably similar to the original hierarchies. An analysis revealed that only three item subsets differed in rank order following the rescaling, and each of these involved only a one level rearrangement with an adjacent item. This indicates that the normative data collected is consistent with the rank order of items within all grammatical categories of the preplanned theoretical DSS construct. The validity of the DSS construct was indicated by the confirmation of the grammatical hierarchies in the reciprocal averaging procedure. The stability and accuracy of the DSS scoring system was enhanced with this analysis through the reweighting of items within grammatical categories.

Although the rank order of structures within the component grammatical categories on the Reweighted DSS are generally similar to those on the original DSS the weights of scores assigned to structures within categories have been altered markedly. Thirty-two of forty-eight weightings were changed. By category, changes from the original DSS to the Reweighted version are as follows:

Indefinite Pronouns	
Original	Reweighted
Level 1	1
2	3
3	3
4	4
5	7
6	7

Personal Pronouns	
Original	Reweighted
Level 1	1
2	2
3	3
4	3
5	5
6	6
7	7

Main Verbs	
Original	Reweighted
Level 1	1
2	1
3	2
4	4
5	6
6	7
7	7
8	8

Secondary Verbs	
Original	Reweighted
Level 1	2
2	3
3	4
4	5
5	7
6	8

Negatives	
Original	Reweighted
Level 1	1
2	4
3	5
4	7
5	7

Conjunctions	
Original	Reweighted
Level 1	3
2	5
3	6
4	5
5	5
6	8

Interrogative Reversals	
Original	Reweighted
Level 1	1
2	4
3	6
4	8
5	8

Wh-Questions	
Original	Reweighted
Level 1	2
2	2
3	5
4	7
5	8

The statistical information on the DSS contained in this chapter is based upon the final Reweighted version of the DSS scoring system.

Additional considerations. The .05 level of confidence was selected as the minimum in reporting significance for the results of the statistical treatment of the data. Two less conventional modifications in reporting significance were also utilized. Confidence levels approaching significance were cited as possible indicators

of trends in the findings. Such preliminary trends can be more thoroughly investigated as this form of language analysis is refined. The nature of several of the analyses to be discussed was to reveal the most useful grammatical categories and hierarchies at different developmental periods; therefore, .01 and .001 confidence levels, as well as exact probabilities, were reported in certain instances.

With the exception of the final discussion concerning the differences in the development of syntax in male and female children the analyses were based upon the language samples of boys and girls combined at each age level. The decision to combine subjects in the general treatment of the normative data was based upon the finding that differences in over-all DSS performance were not found at the two-, three-, and four-year age levels, the language age levels at which the DSS is most often used clinically.

The Reweighted DSS Developmental Patterns

Over-all DSS scores. Obtained means and standard deviations of the over-all DSS scores for two hundred subjects by one-year age groups are presented in Table 5. The over-all DSS measure, or average DSS sentence score, displayed a quantifiable and progressive increase in syntactic development throughout the 2-0 to 6-11 year age period. The mean DSS score, boys and girls combined, progressed from 3.73 for the two-year-old group to 10.94 for the six-year-old group. Standard deviations for the average DSS sentence score remained generally stable throughout the age range of the subject group. Within the 3-0 to 6-11 year age period there was only a slight, consistent increase in the size of the standard deviations with increasing age of the subjects indicating gradually increasing variability in the spontaneous syntax usage of the older children as assessed by this instrument.

Table 5. DSS means and standard deviations of 200 subjects by one-year age groups

Age Group	N	Mean DSS	Standard Deviation
2-0 to 2-11	40	3.73	1.28
3-0 to 3-11	40	6.64	1.00
4-0 to 4-11	40	8.04	1.64
5-0 to 5-11	40	9.19	1.90
6-0 to 6-11	40	10.94	2.26

Table 6 shows the ranges and percentiles of the average DSS sentence score for the two hundred children by one-year age groups. The 10th, 25th, 50th, 75th and 90th percentile values for the over-all DSS within each age group were computed. (Friedman, 1971) Comparison of children's clinical DSS measures with percentile rankings for children of the same chronological or mental age is discussed in Chapter 40.

Table 6. Range and percentiles of DSS scores for 200 subjects by one-year age groups

Age Group	N	Range	Percentiles				
			10th	25th	50th	75th	90th
2-0 to 2-11	40	1.50-6.70	2.30	2.98	3.73	4.48	5.16
3-0 to 3-11	40	4.60-8.60	5.38	5.98	6.64	7.30	7.89
4-0 to 4-11	40	4.86-12.94	6.01	6.97	8.04	9.10	10.06
5-0 to 5-11	40	6.04-13.40	6.72	7.89	9.19	10.49	11.66
6-0 to 6-11	40	6.64-15.84	8.11	9.43	10.94	12.43	13.78

Analyses for the effects of age on over-all DSS score. (a) Analyses of variance for the effects of age: The results of an analysis of variance (Winer 1971) for the over-all DSS scores throughout the 2-0 to 6-11 year age period in table 7 revealed a significant difference by age using the revised or reweighted DSS, $F(4,195) = 105.71$, p is less than .001. A similar finding was reported in a previous study with the original DSS weighting system (Koenigsknecht and Lee 1971).

Table 7. Analysis of variance for the over-all DSS scores by one-year age levels throughout the 2-0 to 6-11 year age period (40 S's in each age group)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio
Between age levels	4	1190.64	297.66	105.71*
Within age levels	195	549.09	2.82	

*p is less than .001

(b) Comparisons between age levels: as shown in table 8 subsequent multiple comparisons on the over-all DSS scores using the Newman-Keuls procedure (Winer 1971, p. 191) revealed significant differences in syntax usage between all successive one-year age levels. Significant, consistent increases in the average DSS sentence score at each increasing age level thus accounted for the significant age effect for the 2-0 to 6-11 year age period. This important finding provided evidence of the clinical usefulness of the DSS at all intervals within the 2-0 to 6-11 year age range as a technique for evaluating children's syntactic development.

Table 8. Summary of Newman-Keuls multiple comparison procedure for difference between the five adjacent one-year age groups for the over-all DSS scores (40 subjects in each group)

Age Group	Degrees of Freedom	q
2-0 to 2-11		
	(2,78)	16.00*
3-0 to 3-11		
	(2,78)	6.50*
4-0 to 4-11		
	(2,78)	4.13*
5-0 to 5-11		
	(2,78)	5.29*
6-0 to 6-11		

*p is less than .01

Developmental scores for the DSS grammatical categories. It is important to analyze performance within the individual grammatical categories because as has been discussed in Chapter 5 of Lee's Developmental Sentence Analysis, 1974, a DSS score by itself does not reveal all the useful clinical information. Table 9 shows the mean weighted developmental scores for each of the DSS component grammatical categories for subjects in one-year age groupings. The weighted developmental score or weighted-sum score, is the sum of the weighted scores for a given DSS component category. Included in Table 9 is a listing of the mean number of DSS utterances earning a sentence point for complete grammaticality.

Table 9. Mean weighted developmental scores on the DSS component grammatical categories and mean number of Sentence Points for 200 subjects by one-year age groups

Age Group	Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions	Sentence Points
2-0 to 2-11	36.55	42.08	50.70	12.68	12.98	7.02	5.32	5.95	24.50
3-0 to 3-11	49.50	94.25	94.08	16.22	16.00	20.60	7.63	4.80	35.28
4-0 to 4-11	56.80	105.53	108.90	25.08	17.40	36.25	7.32	6.40	37.15
5-0 to 5-11	68.35	108.42	139.20	21.72	13.75	61.32	2.00	4.82	39.10
6-0 to 6-11	76.20	109.50	162.95	36.48	15.83	100.95	1.98	2.05	41.38

When the individual DSS component categories are considered in terms of the weighted developmental scores for syntax usage, the DSS again displays measurable and progressive increases in syntactic development with increasing age levels. In the sentence point column the mean number of DSS sentences credited for complete grammaticality increased from 24.50 for the 2-0 to 2-11 year age group to 41.38 per 50-utterance sample for the 6-0 to 6-11 year age group. It must be remembered that only utterances that met the criteria as a DSS scorable sentence were included in this analysis. The jump however, from 49.0 percent of sentences being grammatically error-free according to standard adult usage for the two-year olds to 82.8 percent so classified for the six-year olds represents a useful developmental index. Even at the youngest age level assessed, 50 percent of sentences were grammatically correct relative to adult forms. By the time a normally developing child reaches kindergarten 80 percent of his utterances are in complete agreement with the community adult form. It is not possible to compare this finding directly with the 50- "remark" samples analyzed by Templin (1957) for sentence construction. Yet Templin did report (p. 96) a similar increase in the percentage of remarks with no grammatical errors for her six-year-old subjects. Templin did include "remarks" for analysis which may not have contained the basic subject-verb relationship required of a DSS utterance.

Analyses for effects of age on developmental scores. (a) Analyses of variance for the effects of age: The results of a multivariate analysis of variance (Winer 1971), for the effects of age and sex on the mean weighted developmental scores of the DSS component categories, including sentence point, are presented in table 10. The analysis employed the Wilks' Lambda Criterion for obtaining an approximate F-ratio test for significant differences. With each of the component DSS categories serving as dependent variables a significant F-ratio was obtained for differences in syntax usage across the five one-year age groups. $F(36,684) = 11.39$, p 0.001. When the sentence point category was included in the analysis, differences in mean weighted developmental scores between the males and females approached but did not reach significance, $F(9,182) = 1.85$, p 0.06. The Age x Sex interaction which did not prove to be significant, F 1.00, indicated that the differences across age levels were consistent for males and females.

Table 10. Multivariate analysis of variance of the effects of age and sex on the mean developmental scores within the DSS component categories, including Sentence Point (20 boys and 20 girls in each of five one-year age groups)

Source	df Hypothesis	df Error	F Ratio
Age	36	683	11.39*
Sex	9	182	1.85
Age x Sex	36	683	1.00

* p 0.001
p 0.06

Table 11 presents a summary of subsequent univariate analyses of variance of the mean developmental scores within the DSS component categories for the two hundred 2-0 to 6-11 year old subjects in one-year age groupings. A critical finding was that there were significant over-all age differences on six of the eight grammatical categories, as well as on the sentence point category. A review of the mean scores at each age level presented in table 9 indicates that F-ratios for indefinite pronouns - noun modifier, personal pronoun, main verb, secondary verb, conjunction, and sentence point categories are attributable to consistent score increases with increasing age level. The significant F-ratio for the interrogative reversal category and the nearly significant F-ratio for the wh-question category may have resulted from decreases in the mean scores with increasing age levels. A significant F-ratio was not obtained for the negative component.

Table 11. Summary of univariate analyses of variance of the mean developmental scores within DSS component categories, including Sentence Point, by Age (200 subjects in one-year age groupings)

Categories	F Ratio	p less than
Indefinite pronouns	19.66	0.001
Personal pronouns	52.38	0.001
Main Verbs	65.03	0.001
Secondary Verbs	20.56	0.001
Negatives	0.88	0.48
Conjunctions	59.76	0.001
Interrogative reversals	5.17	0.001
Wh-questions	2.30	0.06
Sentence point	25.10	0.001

[a]df = 4,190

(b) Comparisons between age levels: As shown in table 9, the mean developmental scores within specific DSS component categories frequently evidenced substantial increments between adjacent one-year age groupings; while in other instances these scores revealed no substantial gains from one age level to the next. This indicated that different syntactic structures on the DSS are critical in measuring changes in language development at different age levels. Subsequent multiple comparisons for each DSS category between all adjacent one-year age groupings, using the Newman-Keuls procedure, indicated which grammatical categories revealed differences between adjacent age groups were shown for at least four of the component DSS categories at each successive age interval of comparison. The two- and three-year age groups differed

significantly on the indefinite pronoun - noun modifier, personal pronoun, main verb, conjunction categories. A significant difference between these two age groups was also found on the secondary verb category but not on the sentence point category. In comparisons of the performance of four- and five-year age groups the indefinite pronoun - noun modifier, main verb, and conjunction categories continued to reveal an age effect. A significant difference was also found on the interrogative reversal category in this age comparison.

There was a sharp drop in the interrogative reversal mean weighted developmental score of the older group. The six-year-old children also scored significantly higher on the main verb and conjunction categories than the five-year-old children. They scored in addition, significantly higher on the secondary verb category and significantly lower on the wh-question category.

Across all age groupings, children scored significantly higher on the very important main verb and conjunction categories at each successive age level. Scores on indefinite pronoun, the personal pronoun, and secondary verb categories revealed significant increments between two of the four age-level steps.

Table 12. Summary of Newman-Keuls multiple comparison procedure for differences between the five adjacent one-year age groups for the nine DSS scoring categories (40 subjects in each group)

Age Level	Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions	Sentence Points
2-0 to 2-11 > 3-0 to 3-11	4.04*	11.66*	8.98*	1.98*	1.47	5.33*	1.61	1.19	6.35*
3-0 to 3-11 > 4-0 to 4-11	2.56	3.17*	3.12*	4.86*	0.69	3.96*	0.18	1.17	1.78
4-0 to 4-11 > 5-0 to 5-11	3.22*	0.82	5.40*	1.69	2.06	4.78*	4.36*	1.10	1.86
5-0 to 5-11 > 6-0 to 6-11	1.89	0.27	3.66*	6.97*	1.20	6.06	0.04	3.22*	2.55

*$p < 0.05$ (df = 2,78 for all comparisons)

Table 13. Discriminant function analyses rank order of the DSS categories from the most discriminating between successive levels to the least discriminating (40 subjects in each one-year age group)

Age-Level Steps			
2-0 to 2-11 3-0 to 3-11	3-0 to 3-11 4-0 to 4-11	4-0 to 4-11 5-0 to 5-11	5-0 to 5-11 6-0 to 6-11
Personal pronouns*	Main verbs*	Main verbs*	Conjunctions*
Main verbs*	Personal pronouns*	Conjunctions*	Main verbs*
Sentence points*	Secondary verbs*	Interrogative reversals*	Secondary verbs*
Conjunctions*	Conjunctions*	Negatives*	Wh-questions*
Indefinite pronouns*	Indefinite pronouns	Indefinite pronouns*	Indefinite pronouns*
Secondary verbs	Negatives*	Sentence points	Sentence points
Wh-questions	Sentence points	Wh-questions	Negatives
Negatives	Wh-questions	Secondary verbs	Personal pronouns
Interrogative reversals	Interrogative reversals	Personal pronouns	Interrogative reversals

*$p < .05$

(c) Discriminant function analyses: Discriminant function analyses (Cooley and Lohnes 1966, p. 116-133) were next completed to determine the discriminating power among categories. These analyses were computed utilizing the weighted developmental scores for each category. The multiple discriminant analyses were completed with the subjects grouped in the five one-year age groups, boys and girls combined. The most useful feature of this procedure was that in essence it determined a rank order of the DSS categories from the most discriminating between adjacent age-levels to the least discriminating. F-ratios as significance measures of the discriminating power for the individual component categories between adjacent age groups were also computed. As is shown in Table 13 , the main verb, conjunction, and indefinite pronoun - noun modifier categories were significant in discriminating between adjacent age groups at all four age-level steps. The personal pronoun, negatives, and secondary verb categories each held significant discriminating power at two of the four age-level steps; personal pronoun for the two youngest age-level comparisons, and secondary verbs for both the youngest and the oldest age-level comparisons. The remaining sentence point, wh-question, and interrogative reversal categories each were significant in discriminating between adjacent age groups in a single comparison at only one age-level step. Sentence point scoring discriminated only between the two youngest age groups. The two question categories were useful in discriminating between upper age groups; both discriminating between upper age groups; both discriminated on the basis of decreasing rather than increasing scores. Thus, all of the nine component categories of the DSS, eight grammatical structures and one Sentence Point, evidenced usefulness in discriminating between adjacent age groupings. The discriminating power of the categories varied. Over-all for the two hundred subjects the rank order of the DSS categories from the most to the least discriminating was: (1) main verbs, (2) conjunctions, (3) indefinite pronouns - noun modifiers, (4) personal pronouns, (5) secondary verbs, (6) negatives, (7) sentence points, (8) wh-questions and (9) interrogative reversals.

Length of Utterances and Maturity of Syntax

It is argued that the DSS successfully measures the impact of not only the developmental level or maturity of syntactical usage but also the typical length of a child's utterances. A corollary inference is that the DSS provides, to a substantial degree, quantification of the grammatical load of all structures combined within separate utterances. Four additional length-maturity measures computed from the language samples for the two hundred subjects provided information supporting these views.

Length-maturity measures. (a) Number of words: The first of these measures was based upon tabulation of the number of words or minimum free forms in the 50-utterance samples. This simple word count procedure did not entail either a morpheme or linguistic transformation analysis. Contractions, such as isn't, don't or I'm were treated as two words. In Chapter 6 the mean utterance length in morphemes (Brown 1973, p. 54) for the 100-utterance samples from the two-year-old subjects is discussed.

(b) Number of DSS entries: A second measure related directly to the length of a child's utterances was the number of scorable entries recorded on the DSS samples. Separate frequency scores were obtained for the number of entries on each of the eight DSS grammatical categories. In addition to the measures in each category a total frequency count reflecting the total number of DSS scorings or entries irrespective of category-type was also derived.

(c) Weighted-sum scores: A combined weighted-sum score, obtained by adding all weighted scores on a DSS sample without regard to which grammatical category the entry was assigned, was the third measure. This measure yields an index of the grammatical load of the child's typical utterances. Across a language sample it is sensitive to both utterance length and maturity of syntactic usage.

(d) Mean developmental scores: A fourth measure, the mean developmental score, was derived by dividing the weighted-sum or weighted developmental score by the number of DSS entries. This is a general measure of the maturity of syntax usage. Weighted-sum scores computed by summing the weighted scores for each DSS entry within a DSS component category, were tabulated for each of the grammatical categories on the 50-utterance samples, table 9. Mean developmental or maturity scores were calculated for entries classified by grammatical category. Combined mean developmental scores were derived for the 50-utterance samples by dividing the combined weighted-sum scores by the total number of DSS entries on the sample.

Table 14 contains the means and standard deviations for each of the four length-maturity measures on the 50-utterance DSS samples with subjects in one-year age groups. Direct comparisons of these findings with those of earlier studies (McCarthy 1930; Davis 1937; Templin 1957) is not possible because only utterances meeting DSS sentence criteria were included in the samples, the stimulus methods and materials were not identical, and the rules for counting words differed. Yet, the developmental patterns of increasing length of response with increasing age revealed in the earlier works was clearly shown on the DSS normative samples.

Children grouped at the two-, three-, four-, five-, and six-year age levels respectively used utterances with a mean length of 3.81, 5.82, 6.89, 7.45, and 9.30 words. Tabulation of the number of DSS entries or scorings per 50-utterance sample displayed a consistent pattern of progressively increasing frequencies of scored grammatical structures with increasing age of the subjects. Children grouped at the two-, three-, four-, five-, and six-year age levels respectively used utterances with a mean frequency of 1.90, 2.76, 3.20, 3.52, and 4.13 DSS entries. The progress increase with age in the mean length of utterance, based upon the word-length measure, was paralleled by the systematic increase with age in the frequency of DSS entries or scorings in these utterances. Clearly the DSS measure which is based upon eight grammatical categories selected to reveal the growth of oral language usage during developmental stages of language learning, is related directly to the typical length of a child's utterances. Certainly the frequency of DSS entries also reflected the ability of a child to combine grammatical operations within an utterance.

A measure, however, which is even more representative of the typical grammatical load contained in a child's responses is the weighted-sum score. This is because the weighted-sum score takes into account the frequency of DSS entries, and in addition, the relative weighting or developmental score for each DSS entry. Children grouped at the two-, three-, four-, five-, and six-year age levels respectively had combined weighted-sum scores of 173.28, 304.18, 363.68, 419.60, and 505.92. The marked increase with age on this measure of typical grammatical load is the result of growth in both utterance length and maturity of the syntactic structures contained in these utterances.

As shown in table 14, the mean combined developmental scores also followed a developmental pattern of consistent progressive increase with increasing age of the subjects. Thus, the total DSS score reflects not only the frequency of scored entries per utterance but also the average weighted developmental scores across the eight component grammatical categories.

Analyses for effects of age on length-maturity measures. Univariate analyses of variance for (a) the number of words, (b) the number of DSS entries, (c) the combined weighted-sum scores, and (d) the combined mean developmental scores on

Table 14. Means and standard deviations for (a) the number of words, (b) the number of DSS entries, (c) the combined weighted-sum scores, and (d) the combined mean developmental scores on a 50-utterance sample (40 subjects in each one-year age group).

Age Group	Number of Words		Number of DSS Entries		Combined Weighted-Sum Scores		Combined Mean Developmental Scores	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
2-0 to 2-11	190.78	87.50	95.15	49.42	173.28	103.78	1.76	0.28
3-0 to 3-11	291.18	62.40	137.75	32.29	304.18	81.06	2.20	0.15
4-0 to 4-11	344.78	78.11	159.78	28.98	363.68	81.98	2.26	0.18
5-0 to 5-11	372.30	87.63	175.92	31.10	419.60	95.45	2.37	0.17
6-0 to 6-11	465.22	103.74	206.68	37.95	505.92	112.78	2.43	0.17

the two hundred 50-utterance samples classified by one-year age levels were computed. As shown in summary table 15, the two length of response measures, the number of words and the number of DSS entries, each revealed a significant age effect. Multiple comparisons using Duncan's Multiple Range Test (Winer 1971, p. 196) showed significant differences on the mean number of words per 50-utterance sample between all successive one-year age levels, with the exception of the four-versus five-year age group comparisons. The difference in the direction of longer utterances for the five-year-olds than for the four-year-olds approached significance. A significant age effect was shown for the measure based directly upon the average developmental level of grammatical structures used. Finally, a significant age effect was also obtained for the important measure of grammatical load, the combined weighted-sum scores.

Table 15. Summary of univariate analyses of variance of (a) the number of words, (b) the number of DSS entries, (c)the combined weighted-sum scores, and (d) the combined mean developmental scores on a 50-utterance sample by one-year age levels throughout the 2-0 to 6-11 year age period (40 subjects in each one-year age group)

Measure	F Ratio*	p less than
Number of words	57.00	0.001
Number of DSS entries	52.07	0.001
Combined weighted-sum scores	68.23	0.001
Combined mean developmental scores	70.21	0.001

*df = 4,195

Thus, with increasing age, as a child gains linguistic competence there is a progressive increase in the grammatical load of his utterances. This is the compound result of a dual developmental progression in mastery of newer, higher level syntactic structures and morphological forms and growth in the number of such structures and forms which he is able to incorporate within an utterance. The DSS procedure assesses the impact of both of these developmental aspects in scaling a child's spontaneous oral language usage.

ITEM ANALYSIS OF THE DSS PROCEDURE

The validity of the DSS scoring procedure was indicated by the significant differences produced between age groups by the over-all scoring procedure and by each of its component grammatical categories, as well as by the sentence point category. As age levels increased, the scores which purported to measure spontaneous syntax and morphology usage increased significantly, indicating that grammatical development was being measured. In addition, the validity of the DSS scoring procedure was assessed internally.

Internal Consistency Using Coefficient Alpha

The internal consistency of the DSS procedure was assessed with Cronbach's coefficient alpha correlation coefficients (Guilford 1954, p. 385). Coefficient alpha provides a general measure of reliability based upon the comparison of individual component or category variance to the variance of the entire instrument. The reliability coefficients for the DSS at the five one-year age levels and throughout the 2-0 to 6-11 year age period are listed in table 16. Major support for the validity of the scoring system was supplied by the high reliability coefficients obtained on this measure. Demonstrating the consistency of measurement of an instrument is a prerequisite to considering its validity. The over-all internal consistency as estimated by Coefficient Alpha was 0.71. The reliability coefficients increased by age level indicating increasing internal consistency for the DSS with increasing subject age.

Table 16. Reliability coefficients for the DSS as measured by Cronbach's Coefficient Alpha at five age levels and throughout the 2-0 to 6-11 year age period

Age Group	r_{tt}
2-0 to 2-11	0.51
3-0 to 3-11	0.57
4-0 to 4-11	0.70
5-0 to 5-11	0.72
6-0 to 6-11	0.78
Over-all	
2-0 to 6-11	0.71

Split-Half Reliability

Across subjects the internal consistency of the scoring procedure was assessed using a split-half procedure. The odd items and the even items were combined and then correlated. The Spearman-Brown formula was used to estimate reliability coefficients. Measures were taken at each one-year age level and for all groups combined on the individual grammatical categories, using weighted-sum scores, and on the over-all DSS using the combined weighted-sum scores, table 17.

The reliability coefficient for the over-all DSS with two hundred subjects combined, which provided the over-all estimate of reliability, was 0.73. This indicated good stability of the scoring procedure within subjects on a 50-utterance

Table 17. Split-half coefficient of reliability for each DSS component category and for sentence totals by one-year age groups, 40 subjects each, and for all age groups combined

Age Group	Over-all DSS	Grammatical Categories							
		Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions
2-0 to 2-11	0.52*	0.47*	0.56*	0.48*	0.36*	0.25*	0.50*	[illegible]24	0.27
3-0 to 3-11	0.53*	0.53*	0.45*	0.44*	0.51*	0.46*	0.31*	0.39*	0.30
4-0 to 4-11	0.56*	0.56*	0.63*	0.51*	0.51*	0.46*	0.48*	0.39*	0.52*
5-0 to 5-11	0.71*	0.68*	0.67*	0.60*	0.56*	0.45*	0.62*	0.51*	0.50*
6-0 to 6-11	0.82*	0.77*	0.71*	0.74*	0.62*	0.60*	0.80*	0.61*	0.54*
Combined Groups									
2-0 to 6-11	0.73*	0.62*	0.66*	0.51*	0.49*	0.67*	0.70*	0.48*	0.59*

*p < .05
df = 38
df = 198

sample. Coefficients for the over-all DSS, all categories combined indicated reliability with increasing age of the subjects. As age increased there was a general increase in reliability coefficients for each of the grammatical categories.

CATEGORY ANALYSIS

Category-Total Correlations

Since the over-all DSS score was stable and produced highly significant differences between age groups it was utilized as a reliable criterion for testing the validity of the individual grammatical categories. Pearson product-moment correlations were computed between the weighted-sum scores for each category and the combined weighted-sum scores for all grammatical categories combined. The item-total correlations for the two hundred subjects throughout the 2-0 to 6-11 year age period are presented in table 18. Each of the individual grammatical categories was positively correlated with the over-all DSS or combined weighted-sum scores. These significant item-total correlations indicated that each of the grammatical categories is measuring increases in oral language development and contributing to the total DSS score. The validity of combining the separate categories to obtain the over-all DSS for scaling a child's level of grammar usage was supported. As was anticipated from the results of the analyses of variance for the effects of age and the associated discriminant function analyses, main verbs and conjunctions were correlated most highly with the over-all DSS measure and the two question form categories obtained the lowest category-total correlation coefficients.

Table 18. Item-total correlations for 200 subjects throughout the 2-0 to 6-11 year age period.

Grammatical Categories	r_{xy}
Indefinite pronouns	0.36*
Personal pronouns	0.38*
Main verbs	0.57*
Secondary verbs	0.34*
Negatives	0.46*
Conjunctions	0.59*
Interrogative reversals	0.24*
Wh-questions	0.17*

*$p < .05$
$df = 198$

Intercategory Correlations

An important assumption in the development of the DSS was that the individual grammatical categories are generally independent of each other. To be maximally useful each category should measure a different feature of syntax and morphology and add an additional component to the total language measure. As a clinical technique DSS analysis is useful in providing a clinician with treatment guidelines based upon discrepancies across and within the eight grammatical hierarchies. Study of the interrelationships of these grammatical categories at various stages of acquisition in the normally developing child would require item-to-item correlations within each of the child's separate utterances.

The correlation of one grammatical structure with another across utterances may be misleading. For example, if in a language sample one utterance contained a level two personal pronoun and a level six main verb, and the next utterance contained a level six personal pronoun and level two main verb, the independent relationship of these categories within these utterances would not be revealed by a comparison utilizing mean scores. Cognizant of this, intercategory correlations with measures across a number of sentences might be interpreted more as indicative of item-total consistency.

Intercategory product-moment correlations based upon the weighted developmental scores for the individual categories were computed for the two hundred subjects. Three main findings emerged from the resulting twenty-eight intercategory correlations, table 19. First, eighteen of the correlations were significant. This indicated that the weighted developmental scores, serving as general indices of the syntactic maturity and frequency of usage of structures within a grammatical category in a language sample, were not generally independent from each other. Second, the two question form categories correlated inversely with the other component categories, but highly with each other. That the two question forms should correlate highly was expected since wh-questions rarely occur independent of interrogative reversals. The third pattern related to the generally higher correlation of main verbs and conjunctions with the other DSS categories, and the generally lower correlations of the two question categories with the other categories. As shown in table 18, main verbs and conjunctions had the highest item-total correlation coefficients while the question categories had the lowest. Each of these findings support the interpretation that DSS intercategory correlations based upon the weighted developmental scores are heavily influenced by the item-total correlations.

Analyses of the Individual Grammatical Categories

The mean number of DSS entries and the mean developmental scores were calculated for each of the eight DSS grammatical categories with subjects in one-year age groupings. These three descriptive measures are shown respectively in tables 20 and 21. By category, they reveal developmental patterns of increasing, decreasing, or unchanging frequency and maturity of the grammatical structures used in spontaneous conversation. Comparisons were made with the mean weighted-sum scores reported in table 9 . Table 22 contains a summary of univariate analyses of variance for each of these measures with subjects classified by one-year levels.

Indefinite pronoun - noun modifiers. The discriminant function analyses reported earlier, table 11 , showed this grammatical category to be significant in discriminating between all successive one-year age levels. As shown in table 9 the mean weighted sum scores serving as a combined frequency-maturity index, systematically increased within the range of scores from 36.55 for the youngest subjects to 76.20 for the oldest group. There was a fairly consistent increase

Table 19 . Product-moment correlations among DSS grammatical categories using mean developmental scores for 200 subjects throughout the 2-0 to 6-11 year age period

Grammatical Categories	Grammatical Categories						
	Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals
Personal pronouns	0.47*						
Main verbs	0.64*	0.68*					
Secondary verbs	0.35*	0.45*	0.51*				
Negatives	0.06	0.26*	0.21*	0.15*			
Conjunctions	0.57*	0.54*	0.80*	0.55*	0.08		
Interrogative reversals	0.12	0.07	0.13	0.09	0.17	0.21*	
Wh-questions	0.16*	0.05	0.05	0.15*	0.14	0.18*	0.53*

*$p < .05$
df = 198

Table 20 . Mean number of entries per DSS grammatical category on a 50-utterance sample for 200 subjects by one-year age groups

Age Group	Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions
2-0 to 2-11	24.25	25.10	31.25	5.00	2.98	1.65	2.10	2.72
3-0 to 3-11	24.70	46.20	48.38	5.50	3.22	5.80	1.95	2.00
4-0 to 4-11	29.18	50.80	54.72	7.75	3.32	9.93	2.02	2.05
5-0 to 5-11	31.80	52.38	64.68	6.30	2.68	15.60	0.57	1.92
6-0 to 6-11	34.60	52.18	76.88	11.90	2.80	26.93	0.57	0.82

Table 21. Mean developmental scores per DSS grammatical category on 50-utterance samples for 200 subjects by one-year age groups

Age Group	Indefinite Pronouns	Personal Pronouns	Main Verbs	Secondary Verbs	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions
2-0 to 2-11	1.46	1.54	1.57	2.21	3.36	2.15	1.78	1.71
3-0 to 3-11	1.98	2.04	1.94	3.02	4.62	3.08	2.91	1.53
4-0 to 4-11	1.93	2.07	1.98	3.33	5.14	3.71	2.26	1.96
5-0 to 5-11	2.12	2.06	2.12	3.34	4.92	3.94	1.25	1.72
6-0 to 6-11	2.20	2.09	2.10	3.27	5.22	3.72	1.28	1.16

in the mean number of indefinite pronoun entries with each age-level step although the increase was minimal between the two youngest groups, table 20 . A general developmental progression, on the mean developmental scores, table 21 , was accented by a substantial gain between the two youngest age levels. The two-year-olds obtained a mean developmental score of 1.46, while the three-year-olds had a mean of 1.98 on this measure of the developmental level of indefinite pronoun usage. Seventy-three percent of the indefinite pronoun - noun modifiers used by the two-year-olds were either it, this, or that (level one) while 22 percent were either level three quantity words no, some, more, all (adverbial form included), lot(s), one(s), two (etc.), other(s), and another, or level three indefinites something, somebody, or someone. Children in the three-year-old group used almost double this percentage of level three indefinites or modifiers, 40 percent. At the same time their reliance upon it, this, and that was reduced by 16 percent. This substantial shift from level one to level three usage on this category between the two youngest age groups made an even greater difference in the portion of the weighted-sum total for this category assignable to a developmental scoring level. Thus, for subjects at two years of age, 51 percent of the weighted-sum for this category was attributable to level one items versus 46 percent for level three items; for subjects at the next older age level only 28 percent of the weighted-sum for this category was from level-one items in contrast to 61 percent from level-three items.

Univariate analyses of variance for the effects of age on the mean number of entries, the mean weighted-sum scores, and the mean developmental scores within the indefinite pronoun category were all significant.

Personal pronouns. Both the mean number of personal pronouns and their mean developmental score increased with age (tables 20 and 21 respectively). Sharpest yearly increments on both of these measures occurred during the younger age periods, with only modest gains seen in the older, 4-0 to 6-11 year age interval. The discriminant function analyses for scores in this category, table 13 , revealed the same information, with significant differences at only the two youngest age-level steps. Level-one items, first and second person personal pronouns, were 51 percent of the category entries in the 2-0 to 2-11 year age group accounting for 30 percent of the weighted-sum score for that category. Level-two items, third person personal pronouns, were 33 percent of the entries and 39 percent of the weighted-score for the same group. At the 3-0 to 3-11 year age level only 20 percent of the weighted-sum score resulted from the use of first and second person personal pronouns. This was in marked contrast to 61 percent of the entries and 60 percent of the weighted-sum score due to the use of third person personal pronouns at the same age. Each of the univariate analyses of variance for the three frequency-maturity measures in this category showed a significant age effect (table 22).

Main verbs. This category and conjunctions were the two grammatical categories showing the most consistent, progressive growth with increasing age on the average weighted-sum or weighted developmental scores (table 9). Consistent increments were obtained for both the frequency of scorings (table 20) and the weightings of these structures (table 21). The discriminant function analyses for main verbs revealed significant differences between all adjacent age levels (table 13). For two-year-olds, 67 percent of the main verb entries were level-one items. For children at three and four years of age respectively, this percentage dropped first to 39 percent and then to 32 percent. The percentage of main verbs scoring at level-two increased from 20 percent in the 2-0 to 2-11 year age group to 50 percent in the 3-0 to 3-11 year age group, and subsequently to 59 percent in the 4-0 to

Table 22. Summary of univariate analyses of variance of the mean number of entries, the mean weighted-sum scores, and the mean developmental scores per DSS grammatical category by one-year age levels throughout the 2-0 to 6-11 year age period (40 subjects in each one-year age group)

Categories	Mean number of DSS entries		Mean Weighted-Sum Scores		Mean Developmental Scores	
	F Ratio*	p less than	F Ratio*	p less than	F Ratio*	p less than
Indefinite pronouns	7.94	0.001	19.66	0.001	27.40	0.001
Personal pronouns	40.33	0.001	52.38	0.001	41.23	0.001
Main verbs	69.24	0.001	65.03	0.001	21.89	0.001
Secondary verbs	16.34	0.001	20.56	0.001	10.67	0.001
Negatives	< 1.00		< 1.00		7.48	
Conjunctions	61.38	0.001	59.76	0.001	9.75	0.001
Interrogative reversals	5.88	0.001	5.17	0.001	4.08	0.01
Wh-Questions	2.60	0.04	2.30	0.06	< 1.00	

*df = 4,195

4-11 age group. The analyses of variance for the number of entries, the weighted-sum scores, and the mean developmental scores in the main verb category each showed a significant age effect.

Secondary verbs. The mean developmental scores for secondary verbs generally increased with increasing age of the subject groups (table 9). This resulted from slight increases in the mean developmental scores at each age-level step and two sharp jumps in the mean number of secondary verbs which occurred between the 3-0 to 3-11 and 4-0 to 4-11 year age groups and again between the 5-0 to 5-11 and 6-0 to 6-11 year age groups. There was a marked increase in the mean developmental scores between the two youngest age groups. There was a clear shift away from the heavy reliance upon the five early-developing infinitival complements (wanna, gonna, gotta, lemme, and let's), 82 percent of category entries, shown by the two-year olds. During the 3-0 to 3-11 year age period children first evidenced noncomplementing infinitives, a level-three item, and participles with level-four scorings. The univariate analyses of variance for the mean number of entries, the mean weighted-sum scores, and the mean developmental scores in the secondary verb category each showed a significant age effect (table 22). The discriminant function analyses for this category were significant between the 3-0 to 3-11 and 4-0 to 4-11 and between the 5-0 to 5-11 and 6-0 to 6-11 year age-level steps. These differences are directly attributable to increases in the frequency of correct usage of secondary verbs during these intervals.

Negatives. There was not a clear developmental progression in the mean weighted developmental scores for negatives (table 9). Nor were there systematic changes in the mean number of negative entries with changes in subjects' age levels. The univariate analyses of variance for these measures across the one-year age levels showed no effect for subject age (table 22). However, the mean developmental scores for negatives did generally increase with increasing subject age (table 21) resulting in a significant F-ratio for the effect of age on this measure (table 22). A developmental progression was shown for example, on the percentage of the weighted-sum scores attributable to the use of level-seven negatives within a speech sample. For children grouped at the two-, three- four-, five-, and six-year age levels respectively, the proportion of negatives at level-seven were 22, 51, 63, 58, and 77 percent. Changes in the average developmental scores of negatives were most apparent between the 3-0 to 3-11 and 4-0 to 4-11 year age groups and between the 4-0 to 4-11 and 5-0 to 5-11 year groups. The discriminant function analyses also revealed significant differences at these age-level steps for negatives.

Conjunctions. Of the DSS component categories, conjunctions and main verbs obtained the most consistent upward developmental progressions on all three frequency-maturity measures (tables 9 , 20 , and 21). The univariate analyses of variance for the mean number of entries, the mean weighted-sum scores, and the mean developmental scores for conjunctions were all significant across the one-year age groupings. The discriminant function analyses reported earlier (table 13) showed this grammatical category to be significant in discriminating between all successive one-year age levels. The original DSS weighting system did not result in a significant age effect for either the mean developmental scores or for the mean weighted-sum scores of conjunctions (Koenigsknecht and Lee 1971). Reweighting of the conjunction category resulted in a major improvement of the DSS scaling system.

Interrogative reversals and wh-questions. Measures on the two question form categories presented similar developmental patterns. The mean number of interrogative reversals and wh-questions decreased with increasing age (table 20). The highest

number of question entries was evidenced by the two-year-olds. Subjects in the 6-0 to 6-11 year age group averaged less than one scoring of these question forms in a 50-utterance sample. For the interrogative reversal category the mean developmental scores decreased at the upper age levels assessed (table 21). There was not a clear pattern on the mean developmental scores for the wh-question forms. The discriminant function analyses for the two question categories resulted in a single significant age-level step difference for each category (table 13). Both the difference in interrogative reversal scores between the 4-0 to 4-11 and 5-0 to 5-11 year age groups and the difference in the wh-question scores between the 5-0 to 5-11 and 6-0 to 6-11 year age groups resulted from decreasing scores with increasing subject age. The older children within this subject group asked fewer questions than the younger children did. Since, obviously, their ability to ask questions did not diminish with age, these results in part reflect the communicative purposes for the utterances of children at different age levels in conversation with an adult.

ADDITIONAL STUDIES OF THE STABILITY OF THE DSS PROCEDURE

Interviewing-Clinician Differences

Analyses were completed to determine if two interviewers elicit significantly different grammatical structures for children of the same age. The two female clinicians whose language samples were treated in this comparison were the only interviewers who obtained language samples from a number of children at each of three adjacent age levels in the two hundred subject group. The language samples of the other clinicians were not analyzed to determine if they showed an interviewer effect. All samples obtained by these two clinicians from subjects in the three-, four-, and five-year age groups were included. One interviewer recorded twenty-three three-year-olds, twenty-one four-year-olds, and eighteen five-year olds; the second recorded eleven three-year-olds, twelve four-year-olds, and six five-year-olds. A multivariate analysis for the effects of age and interviewing clinicians was computed using the Wilks' Lambda Criterion for obtaining an approximate F-ratio test for significant differences. In the computation because of the unequal number of subjects in the three groups an adjustment was made using Tsao's solution (Ferguson, 1971, p. 238). The grammatical categories served as dependent variables. As shown in summary table 23 , a significant over-all age effect was obtained F $(14,158) = 1.77$, $p < 0.05$.

There were no significant differences between DSS scores obtained by the two clinicians, $F < 1.00$. The Age x Interviewing Clinician interaction was not significant. Univariate analyses of variance were also computed to determine if the clinicians elicited different grammatical structures from the children. No significant differences between the samples elicited by the two interviewers were obtained on any of the eight grammatical categories, univariate $F < 1.00$ for all categories. Reliability of the DSS procedure was shown. There was consistency on the DSS samples elicited by different interviewers across three age levels.

Table 23. Multivariate analysis of variance of the effects of age and interviewing clinicians on the mean developmental scores within the DSS component categories, including Sentence Point (91 subjects in three one-year age groups and two clinicians)

Source of Variance	df Hypothesis	df Error	F Ratio
Age (one year groups 3-0 to 5-11)	14	158	1.77*
Clinician	7	79	1.00
A x C	14	158	1.22

*$p < .05$

Stimulus Material Differences, Temporal Reliability, and Sentence Sequence Effects

Three aspects of the reliability of repeated application of the DSS language assessment procedure with the same preschool children were considered in a separate, subsequent investigation. The first dealt with the influence of the type of stimulus material used by the interviewers to elicit conversational speech from children. It had not been possible to study the influence of the type of stimulus material upon the grammar of the two hundred subjects in the original normative study because the more basic goal of developing a useful clinical procedure led to the control of a single order in which the stimulus materials were used.

Temporal reliability of the DSS was the second aspect of reliability studied. The temporal reliability of 50-utterance samples has been questioned by Fisher (1934) for mean length of response measures and by Minifie, Darley, and Sherman (1963) for various language measures. They described the correlation coefficients they obtained as relatively low, indicating that such samples were not consistent from day to day. Repeated measures with the DSS were taken within a short time interval, two weeks, and during a longer time interval, eight months, to reveal the consistency of the syntax and morphology used. The measures taken over the eight month period permitted the first longitudinal analysis of measures with this instrument. Clinically, pre-, interim-, and post-treatment applications of the DSS will most commonly all be taken by the same interviewing clinician. Practical information on the stability of the procedure across repeated measures by the same clinician at various time intervals between measures was needed.

Finally, attention was given to the effects of sentence sequence upon DSS performance. That is, without regard to stimulus material, do grammatical structures and sentences elicited in the first half of a language sample differ from those of the second half of the sample? Do the effects of warm-up and general adjustment to the conversational setting favor better performance on the later utterance in a corpus?

Subjects were between the ages of 4-0 and 5-6 years, with five boys and five girls included in the group. The children were selected randomly from a preschool classroom located in the white, middle-income neighborhood of Glenview, Illinois. All subjects were from monolingual families where standard English was spoken. On the initial DSS all subjects were within the normal range of scores for their chronological age, with the exception of one child who scored two standard deviations below the mean score expected for his age. Children 4-0 to 5-6 years of age were studied because, as discussed earlier, they are responsive to pictures and stories. Many two-year-old children are not familiar with nursery stories, and many six-year-olds and older five-year-olds prefer telling stories to describing pictures. The interviewer, a speech pathologist at the master's degree level, was trained in eliciting and transcribing speech samples following the guidelines presented in Chapter 2 of Lee's Developmental Sentence Analysis.

Four language samples were taken for each subject over a two-week period. Two additional samples were elicited from the same subjects at two subsequent four-month intervals. Pictures and story materials were used in eliciting the spontaneous speech sampled. Two versions of each type of material were counterbalanced over repeated measures. Two sets of story-action pictures were selected from the preprimer series, We Read Pictures and Before We Read (Robinson, Monroe, and Artley 1962). Pictures for telling of "The Three Bears" were from What's Its Name (Utley 1950) and Fun With Tom and Betty (Ousley and Russell 1961). Both the picture and story materials are interesting and appropriate for four- and five-year old children.

A series of repeated measure analysis of variance were computed to test material, trial, and sentence-sequence effects. Separate comparisons were made using the over-all DSS score and each of the eight individual grammatical categories as dependent measures.

Stimulus-Material Differences

Effects of the stimulus variable on the syntactic structures and morphological forms used by these preschoolers was studied on sixty language samples six repeated DSS measures from each of the ten subjects. Twenty-five sentences were elicited with both the pictures and story materials in each sample. The two versions of each type of material were counterbalanced over trials.

The means and standard deviations for the over-all DSS score obtained by stimulus setting are listed in table 24. The mean over-all DSS score for sentences elicited using pictures was 7.77 while for story materials it was 7.41. No significant differences were obtained on a univariate analysis of variance for stimulus-material effects upon the over-all DSS scores, $F < 1.00$.

With each of the component DSS categories serving as dependent variables, a significant F-ratio was obtained for differences in syntax usage across the two types of stimuli employing the Wilks' Lambda criterion, $F(10,109) = 10.16$, $p<0.01$.

The means and standard deviations of developmental scores within the DSS component categories and a summary of subsequent univariate analyses of variance for the effects of stimulus material are contained in table 24 . Although the over-all DSS score was not significantly affected by changes in the stimulus materials four of the nine individual categories did show significant score changes with different materials. These were: indefinite pronouns, personal pronouns, secondary verbs, and interrogative reversals. Subjects tended to use more and higher level indefinite pronoun - noun modifiers in telling "The Three Bears." Higher scores on secondary verbs and interrogative reversals were obtained in response to the picture materials. The type of stimulus material did not affect the two

Table 24. Means, standard deviations, and summary of the univariate analyses of variance for the mean weighted developmental scores within DSS component categories and the over-all DSS scores (10 subjects, 4-0 to 5-6 year age group) by stimulus material

Categories	Story		Picture		F-Ratio
	Mean	Standard Deviation	Mean	Standard Deviation	
Indefinite pronouns	34.78	26.49	24.35	26.39	4.67*
Personal pronouns	42.38	15.02	54.37	18.45	15.22*
Main verbs	52.77	19.59	50.07	15.30	< 1.00
Secondary verbs	7.58	6.63	14.32	11.20	16.06*
Negatives	8.80	8.84	11.75	10.97	2.63
Conjunctions	13.47	12.67	14.10	9.20	< 1.00
Interrogative reversals	2.55	5.16	5.42	9.15	4.47*
Wh-questions	3.13	6.54	5.03	9.86	1.52
Sentence point	18.63	5.67	19.35	5.56	< 1.00
DSS over-all score	7.41	2.05	7.77	2.20	< 1.00

df = 1,118
*$p < .05$

categories shown in the discriminant function treatment of the normative data to be most discriminating between age levels, namely, main verbs and conjunctions. Negatives, wh-questions, and sentence point categories were not significantly affected by changes in stimulus materials. These results indicated that stimulus materials significantly influenced usage within specific grammatical categories, but not the over-all DSS measure. When the DSS is used as part of interim- and post-therapy assessment, as an objective measure of the growth in spontaneous syntactic usage, the same stimulus materials used in the pretherapy measure would be useful, although not absolutely essential.

Temporal Reliability: Longitudinal Analysis

The repeated applications of the DSS sampling procedure were analyzed in three ways.

Four repeated applications in a two-week period. First, the four measures taken during the initial two-week period were compared. It was felt that biases, such as the children's becoming overly familiar with the stimulus material or being concerned about commenting on the same things during repeated sessions, would occur when several samples are taken within a short period of time. The mean DSS score for the ten subjects increased progressively from 6.90 the first sampling to 8.22 for the fourth sampling. For the two-week interval containing four repeated measures a significant increase by trial was observed in the over-all DSS, $F(3,24) = 12.29$, $p < 0.01$. This increase was comparable to approximately a 9-month increase according to the previously obtained normative data. The significant trial effect was also observed on five of the nine individual categories. These were the very important main verb, conjunction, indefinite pronoun, personal pronoun and negative categories.

Three repeated applications at four-month intervals. The second comparisons were based upon the results of the initial testing and those at two subsequent four-month intervals, trials one, five, and six. Clinically the DSS may be used at quarterly annual intervals or at eight-to-nine month school-year intervals for objective pre- versus post-treatment indicators of oral language growth. For the eight-month period containing trials one, five, and six a significant increase by trial in the over-all DSS was observed, $F(2,16) = 8.67$, $p < 0.01$. This increase, reflective of longitudinal growth, was consistent with the normative cross-sectional data for a nine-ten-month language age increase at each child's respective language maturation level. The significant trial effect for these measures was also observed on all the grammatical categories of the DSS. In all categories, with the exception of the two question form categories which evidenced decreasing scores, mean developmental scores increased over the four-month and eight-month intervals. When repeated measurements by the same clinician are taken over longer time intervals changes in over-all DSS measures are consistent with the developmental patterns reported on the cross-sectional research.

Rank order of the DSS scores across six applications. In a third analysis for trial effects the stability of the rank order of the DSS scores for the ten subjects was studied across the six trials. Over the six sessions the children's DSS scores were consistently ranked in relation to one another, Kendall's coefficient of concordance $W = 0.82$ (Ferguson 1971, p. 312). Thus, even though there were score increases over trials, the increases were consistent among subjects.

Sentence Sequence Effects

Sentences elicited in the first half of a language sample were compared with those from the second half of a sample on the sixty DSS measures six repeated DSS samples from each of the ten subjects. Stimulus materials used in the first versus the second half of a sample were counterbalanced over repeated measures. Subjects tended to show lower scores on the second 25 sentences with a mean over-all DSS of 7.47, than on the first 25 with a mean over-all DSS of 7.70. A similar pattern was obtained on seven of the nine individual categories. Scores in the indefinite and personal pronoun categories, however, tended to be higher on the second half of a sample. Repeated measure analysis of variance for sentence sequence effects based upon weighted developmental scores revealed no statistically significant differences on the over-all DSS scores or for any of the individual DSS grammatical categories. The effects of warm-up and general adjustment to the conversational setting did not favor significantly better grammatical usage on the later utterances in a corpus.

Results from this study of three aspects of the reliability of repeated applications of the DSS language assessment technique indicate that the procedure can be used with different stimulus materials, within the interest range of the child, with consistent over-all results. Although biases do occur when presentations are within short time periods, when repeated measurements are taken over longer time intervals the increase in over-all measures are consistent with the developmental pattern suggested from the cross-sectional research. Performance on first set of 25 sentences in a sample is consistent with performance on the second set of 25 sentences.

DIFFERENCES IN THE DEVELOPMENT OF SYNTAX IN MALE AND FEMALE CHILDREN

Literature on child development is replete with general references to the more precocious speech and language development of girls. Studies in grammar acquisition among normally developing children have shown contradictory results in terms of male-female differences. Previous techniques for assessing grammatical development in such work have not emphasized developmental weightings of specific syntactic structures and morphological forms but have relied primarily upon either phrase and sentence length measures or limited type-token analyses. Menyuk (1969) in discussing the finding that sex was not significantly correlated with the number of varying syntactic structures used by subjects of her study of syntactic structures in the language of children reported:

> Age was the only significant variable of the variables tested. One might ask why this is so when much of the literature about language development notes sex and I.Q. differences. This difference in result is probably due to the fact that basic syntactic structures were not being described but rather measures of language which may be affected by these variables and also experimenter and situation variables. Such measures are mean sentence length, total output, and number of variations of vocabulary items (p. 19).

Templin (1957) in presenting norms on the development of articulation, sound discrimination, vocabulary, and sentence structure reported that with the exception of the recognition vocabulary scores, girls obtained a greater proportion of higher scores than boys in each area. Comparisons by sex of sentence structure measures based upon length of response, general complexity of verbalizations, grammatical inaccuracies in sentence structure, and parts of speech did not reveal consistent

sex effects.

Normative studies with recently developed structured language tests have resulted in contrasting findings on differences by sex. Lee (1969) found no consistent differences between boys' and girls' performances at the various age levels on either the receptive or expressive sections of the Northwestern Syntax Screening Test. Girls, however, scored significantly higher on Carrow's (1968) test of auditory comprehension of language structures.

Differences in the development of syntax in male and female children 2-0 to 6-11 years of age were studied using the DSS language analysis procedures. Subjects were the two hundred normally developing children used in the cross-sectional normative study with the DSS.

Over-all DSS Scores

The means and standard deviations of the over-all DSS scores by sex for the two-, three-, four-, five-, and six-year age groups are presented in table 25. The progressive increase in the DSS scores with age discussed earlier is shown for both males and females. The results, by sex, in addition, reveal a progressive increase in the difference between the DSS scores of boys and girls.

Table 25. DSS means and standard deviations of 200 subjects with 20 males 20 females in each of 5 one-year age groups

Age Group	Males		Females	
	Mean DSS	SD	Mean DSS	SD
2-0 to 2-11	3.67	1.11	3.78	1.41
3-0 to 3-11	6.59	0.97	6.68	1.00
4-0 to 4-11	7.74	1.61	8.32	1.59
5-0 to 5-11	8.49	1.93	9.89	1.53
6-0 to 6-11	9.99	2.04	11.89	2.00

With increasing age the girls obtained progressively higher sentence development scores than the boys. For the two youngest age groups the over-all DSS score differences by sex are minimal. At upper age levels, especially in the two highest year age groups the over-all DSS demonstrates greater differences by sex.

Results of an analysis of variance for the over-all DSS scores by sex throughout the 2-0- to 6-11-year age period are summarized in table 26. In addition to the expected significant age effect, $F(9,180) = 56.29$, $p < 0.01$, there was a significant sex effect $F(1,180) = 13.73$, $p < 0.01$. The Sex x Age interaction did not prove to be significant $F < 1.00$. This indicated that the differences by sex were consistent over age levels considered.

Table 26 . Analysis of variance for the over-all DSS scores by sex throughout the 2-0 to 6-11 year age period (20 male and 20 female subjects in each age group)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratios
Sex	1	33.37	33.37	13.73*
Age	9	1231.27	136.81	56.29*
Sex x Age	9	37.59	4.18	1.72
WITHIN CELLS	180	437.50	2.43	

*$p < 0.01$

Subsequent multiple comparisons on the over-all DSS scores employing the Newman-Keuls procedure demonstrated significant differences between the syntax usage of the male and female subjects at the five-year [$q(2,38) = 3.50$, $p < .05$] and six-year [$q(2,38) = 4.10$, $p < .05$] age levels. At the four-year age level the difference approached significance. Differences by sex were not found however at the two- and three-year age levels, the language age levels at which the DSS is most often used clinically.

Developmental Scores for the DSS Grammatical Categories

When the individual grammatical categories are considered in terms of their weighted developmental scores the DSS again displayed a significant difference in syntactic development between males and females. A multivariate analysis of variance for the effects of age and sex was employed using the Wilks' Lambda criterion for obtaining an approximate F-ratio test for significant differences. The sentence point category was excluded in this analysis. With each of the grammatical categories serving as dependent variables, a significant F-ratio was obtained for differences in syntax usage between the males and females F (8,183) = 2.08, $p < 0.05$ (table 27). As discussed in an earlier part of this chapter a significant over-all age difference was obtained F (32, 676) = 12.33, $p < 0.01$. The Sex x Age interaction again did not prove to be significant $F < 1.00$.

Table 27. Multivariate analysis of variance for the effects of sex and age on the mean developmental scores within DSS grammatical categories (20 boys and 20 girls in each of five one-year age groups)

Source of Variance	df Hypothesis	df Error	F Ratio
Sex	8	183	2.08*
Age (one-year groups 2-0 to 6-11)	32	676	12.33*
Sex x age	32	676	<1.00

*$p < 0.05$

Table 30 presents a summary of subsequent univariate analyses of variance of the mean developmental scores within the DSS grammatical categories by sex for the two hundred 2-0 to 6-11 year old subjects. There were significant overall differences on four of the eight DSS grammatical categories. These were (a) indefinite pronouns - noun modifiers, (b) personal pronouns, (c) primary verbs, and (d) conjunctions. It should be noted that as discussed in a previous part of this chapter these are the same grammatical categories most powerful in discriminating between successive age groups. The F-ratio for negatives approached the 0.05 level of significance. Females obtained the higher mean developmental scores for each of the five categories.

Table 28. Summary of univariate analysis of variance of the mean developmental scores within DSS grammatical categories by sex for 200 2-0 to 6-11 year old subjects

Categories	F* Ratio	p less than
Indefinite pronouns	6.68	0.01
Personal pronouns	4.76	0.03
Primary verbs	11.23	0.001
Secondary verbs	0.02	0.89
Negatives	2.63	0.10
Conjunctions	7.86	0.006
Interrogative reversals	0.33	0.57
Wh-Questions	0.04	0.85

df = 1,190

Since our previous research had shown that different syntactic structures on the DSS are critical in measuring changes in language development at different ages it was also expected that specific syntactic structures would be significant in revealing syntax usage differences between males and females at different stages of language acquisition. Subsequent multiple comparisons at each age level by grammatical category using the Newman-Keuls procedure indicated the grammatical categories on which males and females differed significantly. These are summarized in table 29. The higher the age level, the more grammatical categories there were that revealed such differences. In the two lower age groups males and females did not differ significantly on any of the eight grammatical categories. Female subjects in the four-, five-, and six-year age groups scored significantly higher on the indefinite pronoun - noun modifier category. Female subjects in the two oldest age groups also obtained significantly higher scores on the primary verb category. They, in addition, scored significantly higher on the negative and conjunction categories in the six-year age group.

Length of Utterances and Maturity of Syntax Measures

Table 30 contains the means and standard deviations by sex for the number of words, the number of DSS entries, the combined weighted-sum scores, and the combined mean developmental scores on the 50-utterance DSS samples with subjects in one-year age groups. Girls at each one-year age level from 2-0 through 6-11 years of age obtained higher mean scores on each of the four length-maturity measures, without exception.

Table 29. Summary of significant differences by sex for the DSS grammatical categories at each age level with the Newman-Keuls Multiple Comparison Procedure (40 subjects each group)

Age Group	Significant Differences (p 0.01)
6-0 to 6-11	Indefinite pronouns Personal pronouns Primary verbs Negatives Conjunctions
5-0 to 5-11	Indefinite pronouns Primary verbs
4-0 to 4-11	Indefinite pronouns

The higher scores at each age level on the number of words and the number of DSS entries indicated that female subjects typically used longer utterances requiring the use of more grammatical rules within utterances. On the mean weighted-sum score measure held to be representative of the typical grammatical load contained in a child's responses girls scored higher than boys at each age level. As discussed earlier, the weighted-sum score takes into account the frequency of DSS entries and the relative weighting or developmental score for each entry. Girls also maintained a lead at each age level on the mean combined developmental score or the average weighted developmental score across the eight grammatical categories of the DSS.

Table 30. Means and standard deviations by sex for (a) the number of words, (b) the number of DSS entries, (c) the combined weighted-sum scores, and (d) the combined mean developmental scores on a 50-utterance sample (20 boys and 20 girls in each of five one-year age groups)

Age Group	Sex	Number of Words		Number of DSS Entries		Combined Weighted-Sum Scores		Combined Mean Developmental Scores	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
2-0 to 2-11	Male	174.70	79.48	90.75	48.64	161.55	97.83	1.75	0.24
	Female	206.85	94.09	99.55	51.05	185.00	110.67	1.77	0.33
3-0 to 3-11	Male	284.00	48.33	134.75	19.57	293.50	46.62	2.18	0.16
	Female	298.35	74.48	140.75	41.69	314.85	105.24	2.22	0.15
4-0 to 4-11	Male	332.00	74.22	155.80	31.64	350.50	80.76	2.24	0.18
	Female	357.35	81.70	163.75	26.27	367.85	83.10	2.28	0.20
5-0 to 5-11	Male	340.90	72.22	166.45	33.07	385.35	101.53	2.29	0.19
	Female	403.70	92.03	185.40	26.50	453.85	76.96	2.44	0.12
6-0 to 6-11	Male	437.90	106.65	191.05	36.76	459.45	105.71	2.40	0.19
	Female	492.55	95.62	222.30	33.02	552.40	101.91	2.47	0.15

Analyses of variance for the effects of sex on each of the four length-maturity measures on the two hundred 50-utterance samples were computed with twenty boys and twenty girls in each of the five one-year age groups. As displayed in summary table 31 each revealed a significant sex effect. Across all age levels assessed the female subjects evidenced earlier mastery of newer, higher level, syntactic structures and morphological forms and greater numbers of such structures and forms within an utterance.

Table 31. Summary of analyses of variance for the effects of sex on (a) the number of words, (b) the number of DSS entries, (c) the combined weighted-sum scores, and (d) the combined mean developmental scores on a 50-utterance sample (20 boys and 20 girls in each of five one-year age groups)

Measure	F-Ratio*	p less than
Number of words	10.32	0.01
Number of DSS entries	8.17	0.01
Combined weighted-sum scores	12.54	0.01
Combined mean developmental scores	5.61	0.05

*df = 1,190

By sex the mean number of DSS entries, the mean weighted-sum scores, and the mean developmental scores were calculated for each of the DSS grammatical categories with subjects in five one-year age groups. Table 32 represents a summary of the analyses of variance for the effects of sex on each of these measures for the eight DSS grammatical categories. Girls scored a significantly higher number of personal pronouns, main verbs, and conjunctions as indicated by the mean number of DSS entries in those categories. Girls obtained significantly higher weighted-sum scores than boys on the indefinite pronouns - noun modifiers, personal pronouns, main verbs, and conjunctions. As discussed earlier these four categories were found to have the greatest discriminating power on usefulness in discriminating between adjacent age groupings in the normative cross-sectional study. Girls also obtained significantly higher developmental scores on the indefinite pronoun-noun modifier and negative categories.

The results of this study showed that females at increasing age levels evidenced progressively higher developmental sentence scores than did the males. Significant differences by sex were not found however, at the two- and three-year-old age levels, the language age levels at which the DSS is most often used clinically. There were significant over-all differences with higher scores by the girls on four of the eight DSS component categories when the weighted developmental level of the structures was the primary consideration. These were indefinite pronouns - noun modifiers, personal pronouns, primary verbs, and conjunctions. Higher level usage of negatives by the girls approached significance. In addition to the differences shown on the level of maturity of structure usage, females also used longer sentences and utterances of greater grammatical load of combined structures.

Table 32 . Summary of analyses of variance for the effects of sex of the mean number of entries, the mean weighted-sum scores, and the mean developmental scores per DSS grammatical category (20 boys and 20 girls in each of five one-year age groups)

Categories	Mean Number of DSS entries F-Ratio*	Mean Weighted-Sum *Scores* F-Ratio*	Mean Developmental *Scores* F-Ratio*
Indefinite Pronouns	2.11	6.70**	6.32**
Personal Pronouns	4.90**	4.92**	< 1.00
Main Verbs	9.86**	11.45**	2.51
Secondary Verbs	< 1.00	< 1.00	1.44
Negatives	1.68	2.84	5.72**
Conjunctions	8.55**	7.90**	< 1.00
Interrogative Reversals	< 1.00	< 1.00	1.60
Wh-Questions	< 1.00	< 1.00	< 1.00

*df = 1,190

** $p < 0.05$

SUMMARY

The results of this series of investigations of the validity and reliability of the DSS procedures and its reweighted scoring system strongly support its usefulness as an objective measure of syntax development in children. The validity of the DSS measure was indicated by the significant differences produced between age groups by the over-all scoring procedure and by each of its component grammatical categories. As age levels increased, the scores which purported to measure spontaneous syntax and morphology usage increased systematically, indicating that grammatical development was being measured. All nine of the component categories of the DSS, eight involving specific grammatical structures and one the over-all sentence point, were useful in discriminating between adjacent age groupings. The discriminating power of the categories varied. The rank order from the most to the least discriminating was (1) main verbs, (2) conjunctions, (3) indefinite pronouns - noun modifiers, (4) personal pronouns, (5) secondary verbs, (6) negatives, (7) sentence points, (8) wh-questions, and (9) interrogative reversals. Evidence was presented which showed that the DSS successfully measures the impact of not only the developmental level or maturity of syntax usage but also the typical length of a child's utterances.

The validity of the DSS construct was further indicated by the confirmation of the grammatical hierarchies in the reciprocal averaging procedure itself. The stability and accuracy of the DSS scoring system was enhanced with this analysis through the reweighting of items within grammatical categories.

Major support for the usefulness of the scoring system was supplied by the high reliability coefficients obtained by this measure. The over-all internal consistency of the instrument as measured by coefficient alpha was 0.71. The within-subject internal consistency of the scoring procedure was assessed in a split-half procedure in which odd items and even items were combined and then correlated. This resulted in an over-all estimate of reliability of 0.73 which indicated good stability of the scoring procedure within subjects on a 50-utterance sample. Each of the individual grammatical categories was positively correlated with the over-all DSS scores, indicating that each of the grammatical categories is measuring increases in oral language development and contributing to the total DSS score. Item analyses for each of the grammatical categories revealed the usefulness of each category at specific age levels.

The stability of the DSS procedure was clearly evidenced by the results of studies of stimulus material differences, temporal reliability, sentence sequence effects, and interviewing-clinician differences. Repeated applications of the DSS language-assessment technique indicated that the procedure can be used with different stimulus materials, within the interest range of the child, with consistent over-all results. Although biases do occur when presentations are within short time periods, when repeated measurements are taken over longer time intervals of either four or eight months increases in the over-all measures are consistent with the developmental pattern suggested from the cross-sectional research. The effects of warm-up and general adjustment to the conversational setting did not favor significantly better grammatical usage on the later utterances in a corpus. There was consistency on the DSS samples elicited by different interviewers across three age levels.

There were differences in the development of syntax in male and female children. Girls at the upper age levels assessed obtained progressively higher developmental sentence scores than did the boys. Girls scored significantly

better than boys on primary verbs, conjunctions, personal pronouns, and indefinite pronouns. Significant differences by sex were not found however on the over-all measure at the two-, three-, and four-year age levels, the language age levels at which the DSS is most often used clinically. The normative chartings of the DSS for clinical comparisons therefore are based upon the combined male and female subject data.

The central purpose of this section was to report on the stability and validity of the DSS as an objective measure of a child's spontaneous use of syntactic structures and morphological forms. Analysis of the normative data for this instrument resulted in substantive new information on the acquisitional order of syntactic structures and morphological forms and the interrelationships among sentence structures.

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SECTION III

INTERACTIVE LANGUAGE DEVELOPMENT TEACHING

Interactive Language Development Teaching is a clinical procedure for presenting grammatical structure to children with language learning problems. It was developed at the Northwestern University Speech and Language Clinics and has been used extensively with groups of children for whom the learning of grammatical structure was the primary goal. These were usually children who already had an expressive vocabulary of thirty to forty words and were beginning to use word combinations occasionally, but whose sentence structure and use of syntactic forms was considerably below expectations for their chronological and mental ages. These language groups have usually consisted of four to six children in the preschool age range of three to six years. With one-hour clinical sessions four times a week over a one-year period, and sometimes a two-year period, it was imperative to find a procedure that would maintain interest and enjoyment for such young children and would, at the same time, be an effective language teaching device. Unstructured methods of simple "language stimulation" have not always produced the desired results in clinical teaching, and highly structured, imitative drill sessions sometimes diminish the interest of both clinicians and children over extended periods of treatment. Interactive Language Development Teaching attempts to avoid these two extremes by presenting language in a controlled, developmental sequence, but, at the same time, preserving the natural child-adult interaction of normal language learning.

RATIONALE FOR INTERACTIVE LANGUAGE DEVELOPMENT TEACHING

The information gained from the analysis of a child's spontaneous speech allows a prescriptive remedial approach based upon the comparison of his grammatical usage with the normal acquisitional order. Not only can immediate teaching goals be determined from a child's DSS, but progress can be accurately measured, and long-range program planning can be projected from periodic language samples.

Language growth develops in two ways: (1) more mature grammatical forms appear in the child's language and (2) he is able to combine more types of grammatical structures into a single sentence. Thus, both the maturity and the frequency of grammatical forms contribute to the increasing grammatical load which a child shows in his spontaneous speech. Even at the earliest stages of expressive language usage, syntactic structures and morphological forms do not occur in isolation. Children who have impaired language skills can often use a particular structure accurately in a short phrase or in isolation but cannot utilize that same structure in combination with others. The grammatical load of the sentence appears to be a critical variable. One important aspect of treatment is expanding the child's ability to handle an increasing grammatical load and to maintain appropriate use of newly learned language structures in combination with other structures. Interactive Language Development Teaching seems particularly well suited for this goal, since in the conversational interchange between clinician and child, language structures are presented in combination, not one by one.

Interactive Language Development Teaching approximates as closely as possible the conversational setting of normal language development. Parents do not ask children to imitate their speech but instead talk to them in simplified language concerning environmental events. The semantic content of language is emphasized more that grammatical precision, and if new words or grammatical constructions are needed, the social context always provides immediate meanings for them. Parent-child conversations also require a child to shift speaker and listener roles constantly. Either person can initiate topics or ideas and either one can ask or answer questions. Thus, if clinical teaching is to capitalize on these features of normal language acquisition, it must create a setting where language can be spontaneous, non-imitative, and meaningful and where both receptive and expressive skills can be practiced. Since such conversations cannot be left to chance in a clinical setting, story-telling provides an effective substitute. A child-clinician interaction can be centered around a simple story presentation which duplicates the common, everyday experiences that parents and children talk about.

Normally developing children are capable of generalizing grammatical rules from the conversational speech of parents, but clinical children have shown reduced ability for the self-discovery of grammatical rules. A structured interchange between clinician and child helps to highlight the grammatical problems the child is encountering. The clinician needs to reformulate, remodel, correct, or expand a child's utterances in an effort to elicit more mature language from him. While parents may produce these corrections or expansions only occasionally, clinicians need to do it constantly. This interchange encourages a child to pay closer attention to grammatical forms, to listen carefully, and to find the meaning of what is being said in the social context.

In Interactive Language Development Teaching, the child responds to questions or prompts which develop out of the plot line of the narrative. He is not merely asked to repeat pre-selected lists of sentences. At times he will even be led to ask questions. It is natural for a child to answer a question and for someone to comment on his response. In turn, it is natural for the child to feel free to elaborate upon or respond to a prompt or question within the exchange. This process develops a tolerance for the demand of spontaneous language formulation. Drills based entirely on rote repetition of phrases and sentences do not provide this experience.

Interactive Language Development Teaching incorporates many aspects of normal language acquisition into a clinical procedure. The lessons are developmentally organized and presented in story-telling form. The clinician reads a few lines of the story, then asks the child a question to elicit a target response which contains one or more of the grammatical goals of the lesson. The clinician then uses a variety of techniques for helping the child produce a more mature response than he originally gave. In this way grammatical structure is presented to children in verbal interaction with an adult, discussing subjects which are familiar and meaningful to him.

THE STRUCTURE OF THE LESSON

The stories developed in the course of this project and published in Lee, Koenigsknecht, and Mulher's Interactive Language Development Teaching: The Clinical Presentation of Grammatical Structure, 1974, were designed for small groups of three to six children in a fifty-minute clinical session, but Interactive Language Development Teaching can be modified to meet other time requirements and other clinical settings. It is recommended that the session begin with a three to five minute period of routine activity to get children settled and ready to listen. A calendar activity in which children place their printed name-cards under the appropriate day of the week has been found most satisfactory for this

purpose. Children learn to recognize their names, learn the names of the other children and the clinician, and are exposed to the names of the days of the week. Children are not expected to learn the serial order of day-names but are expected to become familiar with this vocabulary and with the linguistic patterns of referring to time. Sterotyped phrases such as "Iam here on Tuesday" serve to establish listening and responding behavior, to emphasize taking turns, and to provide a classroom atmosphere.

The story presentation takes thirty to thirty-five minutes of a fifty-minute session. A different story theme is used for each lesson as the vehicle for presenting and teaching language structures. Although all the children in a group hear the same story, the clinician treats each child individually when he responds to questions. Some children may progress at a faster rate than others, and more can be expected of them in terms of the target sentences. By carefully selecting and modifying the questions she asks of each child and by using the appropriate level of prompts for expanding each response, the clinician adapts the general procedure to individual needs. The children are called upon in a random order and an attempt is made to provide each child with an equal number of opportunities for response.

It is advisable to have a short break after thirty minutes of concentrated listening and responding to the story. Children may help rearrange the room, put away story materials, or get a drink, so that they have a moment of relaxation. The final ten to fifteen minutes of each lesson is devoted to a group activity where material related to the story is presented in a new form. Pencil and paper activities may include drawing, tracing, coloring, cutting, and pasting; real life activities such as washing, cleaning, hiding and finding objects may be appropriate; imaginative activities such as dressing up, playing store and role-playing could be used. In all cases, the activities should relate to the theme, concepts, vocabulary, and grammatical structures presented during the story period, and the children should be encouraged to use in a spontaneous way the language which was presented to them first in a structured story form. Transcripts of the children's utterances during this section of the lesson are useful for judging their progress and for modifying the treatment goals in subsequent lessons. Thus, there is continuity in the sequence of lessons based upon the prescriptive needs of the individual children in the group.

WRITING THE STORY

Lesson goals are derived from the Developmental Sentence Analysis of a child's spontaneous language sample. Long range goals include a variety of pronouns, verb forms, negatives, conjunctions, and questions which he may be using inconsistently or which are one step above his demonstrated expressive language level. Any one lesson selects four or five items from the many possible structures that would be developmentally appropriate and places them as target structures to be elicited from the child as responses to questions. Thus, the format of the story provides one column for the clinician's narrative interspered with questions and another column for the anticipated target responses of the child. By reading the list of sentences in the target response column, one can easily ascertain the language goals for any particular lesson and can judge the level of the language the child is being asked to produce. The Lee, Koenigsknecht, and Mulhern text contains a set of stories with beginning language goals and another set with more mature language structures where this progression of language development is evident.

The stories contained in that book are not intended to be a workbook for a clinician to follow in rigid sequential order with any one child or group of children. They are intended to illustrate the type of language presentations which clinicians can create themselves. In writing effective language stories there are many guidelines the clinician can follow to highlight the grammatical structures of the lesson, to clarify their meanings, and to increase the

probability that the child's response will come as close to the target as his capabilities allow. The following suggestions should prove helpful to clinicians in writing effective language development stories:

1. Select a story topic that is within the child's experience. The theme of a story must reflect the experience and background of the children for whom it is written. New information and unfamiliar ideas should be avoided when the goal of a story presentation is language development. Children should not have to struggle with both content and grammatical structure at the same time, and closer attention can be given to structure if the content is familiar. Therefore, such subjects as Eskimos and igloos, butterflies and cocoons are inappropriate for this purpose. Also, the story themes should be realistic rather than fanciful; witches and elves are not suitable characters. Animals that talk to one another are common enough in television cartoons to be acceptable to clinical children, but stories where humans and animals talk together should be avoided as too unrealistic. Stories which anticipate Christmas have been found distracting to the goals of a language lesson, and sad or tragic stories involving injury, accident, and death are apt to be upsetting or even confusing.

Suitable themes for language development stories are the common, everyday experiences involving family members and their activities, going to the store, planning a birthday party, playing in the snow, caring for pets, making visits to the park, the beach, or the airport. Such topics are within the experience of middle-class suburban children but would have to be modified for urban or rural groups or for institutionalized children. Story themes should provide action, dialogue between characters, and some degree of suspense which makes it possible for the children to guess, infer, and anticipate events. Stories about putting out a fire or going to Kiddyland will hold interest better than writing a letter to Grandma. Three or four characters are sufficient; more than that may be confusing. All characters should be named by proper names. Attempts to utilize a continuing plot through several stories have not proved successful since children with language problems may have difficulty maintaining the continuity of a plot from one day to the next. Each story should be independent and come to a logical conclusion. The stories in Section II illustrate the types of subjects which have been found most satisfactory for interactive language teaching. By glancing through their titles, the clinician may gain ideas for further story presentations suitable to her own group of clinic children.

2. Provide sufficient narrative to keep the children's attention. The number of sentences in the narrative prior to the elicitation of a target response can vary. Children in beginning language development groups may have such limited attention spans and such poor receptive skills that three or four sentences of narrative are all they can handle at one time. The clinician will need to intersperse questions and elicit responses frequently in order to make sure the story is clear and understandable to them. Fairly short narrative presentation with little content to remember will be used with lower level stories. More advanced children may be expected to follow the story line through seven or eight sentences of narrative. The clinician must constantly evaluate a child's receptive capacities and provide adequate opportunity for him to follow the unfolding of an idea through longer and longer stretches of narrative. However, since language production by the child is the ultimate goal, the clinician should not get carried away with her own story-telling, neglecting to provide adequate opportunity for verbal interaction with the children.

3. Provide adequate build-up of semantic content for the target structure. Since one of the chief goals of interactive language teaching is to present language in a meaningful context rather than as an imitative drill, careful attention must be given to the informational content of the narrative which precedes a question. Sometimes the three to eight lines of narrative present the same information in a variety of ways so that the semantic content is repeated while the grammatical structure is changed. Sometimes the narrative can provide simplification of a difficult grammatical structure through a series of built-up sentences. Frequently a sentence with a conjunction is more easily comprehended if its component sentences are presented spearately. Sometimes a new or difficult target structure can be included in the narrative twice bofore a child is asked to produce it. The narrative also may stress related vocabulary so that the meaning of a target response is clarified by the association of lexical items. As the clinician writes the story, she should try to anticipate what difficulties the children may have with the semantic content of the target responses and the narrative can then be written to increase the probability of grammatical comprehension.

4. Introduce new structures receptively before eliciting them as targets. The narrative need not be confined to only those grammatical items which are to be elicited from the children. Indeed, it would be difficult to write an interesting story using only the earliest grammatical forms. There is great value in having children hear plural pronouns, modal verbs, infinitives, and tag questions within the meaningful story context before they are asked to produce them. The clinician must use good judgment in the choice of structures she includes in the narrative and avoid grammatical items that are too far advanced over the children's expressive level. In general, the narrative can contain structures one or two DSS levels above those expected as target responses.

5. Provide frequent review to stabilize structures previously introduced as target responses. It is important to continue using structures once they have been presented and not to neglect them in succeeding sessions. Lesson planning should be cumulative, and structures which have received primary emphasis as target responses should continue to receive secondary emphasis occasionally in later lessons. As a general rule, primary emphasis means at least five presentations in a single lesson, while secondary emphasis is considered to be three or four presentations. Sometimes the secondary emphasis is given to introduce new grammatical forms and sometimes to review or stabilize them, while the primary emphasis is reserved for intensive work on the lesson goals.

6. Clarify the concepts underlying the contentive vocabulary. While Interactive Language Development Teaching is designed primarily for the presentation of grammatical structure, attention should be given to the vocabulary of lexical nouns, verbs, and adjectives which are written into the stories. Vocabulary and grammatical structure reinforce and clarify one another in a conversational context, and there are many opportunities to explain vocabulary by way of grammar and often to explain grammatical structure by way of vocabulary.

In almost all story presentations there is opportunity to present contentive vocabulary related to a general theme and, thus, to strengthen common word associations. The vocabulary stressed in each lesson is listed at the top of the story. Thus, the clinician can introduce various kinds of vocabulary-building opportunities involving opposites, superordinates, word associations, word recall, all of which strengthen a child's ability to handle his lexicon of of contentive words.

7. Include questions which elicit creative thinking. Not all questions in a narrative must necessarily elicit predetermined target responses. Sometimes children are asked to make spontaneous guesses from clues within the story. Frequently the clinician can depart from the prepared story to ask questions which occur to her on the spur of the moment or in response to some spontaneous remark of a achild. Interactive Language Teaching is particularly well suited to this type of conversational interchange which occurs fortuitously in a lesson. It provides an opportunity not only to observe the children's spontaneous language formulation but also to introduce creative and inferential thinking, logical problem solving, and other abstract verbal tasks.

PRESENTING THE STORY

Interactive Language Development Teaching was designed primarily for use with a group of three to six children, but it can be used in individual lessons. While this technique was intended for preschool and primary grade children, it has occasionally been modified for use with older children. A small room should be used, but large enough to accommodate the group without crowding. Usually the children are seated at a table during the story presentation. It is most convenient to use a circular table or a V-shaped table arrangement. A flannel board on an adjustable easel is placed to the side of the clinician's hand of preference. The children's line of vision and height when seated should be considered in determining the height and angle of the flannel board. If possible, the clinician's chair should be on casters to facilitate ease of movement.

The clinician is allowed considerable flexibility in reading the prepared narrative. She may depart from the script whenever her own judgment dictates, she may repeat sections, she may elaborate spontaneously, and she may introduce new material as it occurs to her. Many beginning clinicians have a tendency to emphasize target structures unnaturally in language training, but children's interest is not enhanced by exaggerated prosodic emphasis. A natural conversational pattern of emphasis should be used. One can highlight structures in the story through repetition or use of exclamations but should not slow down or change the natural prosody of the utterances. Sing-song or monitoned presentation of the narrative and language models should be avoided. However, presentation can be too rapid. Many children with language problems seem to require more time to process utterances than other children. It is important not to rush through the narrative. Providing appropriate pacing and tempo in the story cues the children to be prepared to respond; too slow a presentation tends to result in lethargic participation by the children.

The verbal presentation should always be accompanied by visual materials such as flannel board cut-outs, puppets, toys, and objects. The materials should be extremely simple, just enough to keep the subject of the story in visual attention, since auditory attention alone may be poor. Experience has shown that flannel board materials are the easiest to make and to handle during the lesson presentation, and they are by far the least expensive. Also, flannel board materials can easily be placed out of children's sight, thus providing surprise and novelty during the story. It has been found advisable to keep materials out of children's reach as well, since manipulating toys, puppets, and even pictures during the story can be distracting to the lesson goals.

Eliciting the target response is the focal point of expressive language teaching. Children are called upon one by one and several children may be asked the same stimulus question in turn. If the child's response is less than the target, the clinician engages in an interchange with him in an effort to elicit

a longer or more accurate version of the target sentence. There are a number of techniques that the clinician has at her disposal for this purpose, and there is a general order in which they should be applied. Some interchange techniques offer a child more help than others, and a clinician should be aware of each child's abilities and the degree of help he needs in bringing his initial response closer to the target. The following interchange techniques are listed in the order of most to least help offered to the child:

1. Complete model. a repetition of the desired target response which the child then imitates is typically used as a first step in establishing a response. This is an imitative task in which the child is provided with the exact utterance expected. For example:

Stimulus Question	Target Response
Were they hot?	They were hot.

Interghange

Child: They hot.
Clinician: Were.
Child: They were hot.

This elicitation technique is typically used after a child can consistently imitate a complete model. The child's task is not imitation but rather reformulation of an utterance with assistance to include the critical elements. One exception to the use of the complete model as the first step in teaching is the introduction of interrogative reversals. The critical point in question formulation is the reversal of the subject of the sentence and the first auxiliary of the verb. A reduced model has proved to be the most efficient means in highlighting the critical elements of this structure. Thus reduced models are the first prompts used to establish question responses. For example:

Stimulus Question	Target Response
What did Bobby say?	Can I go out?

Interchange

Child: I go out?
Clinician: Can I?
Child: I can go out?
Clinician: Can I go out?

3. Expansion Requests. Next in the general hierarchy of these techniques is the request for a child to expand his incomplete response without a model from the clinician. No clue to which element has been omitted or incorrectly attempted is given to the child. The child is merely told that his response is not complete. Expansion requests can take various forms, "Tell me the whole thing," "Tell me some more, " "Say all of it." In this task the child is encouraged to be less dependent on the clinician for modeling or monitoring his response. The child is directed to re-auditorize what he has said and produce a more accurate utterance. For example:

Stimulus Question	Target Response
What is Bobby doing?	Bobby is going to the park.

Interchange

Child: Bobby going park.
Clinician: Tell me the whole thing.
Child Bobby is going.
Clinician: Tell me more.
Child: Bobby is going to the park.

4. Repetition Request. The next in this series is a request for the child to repeat his response to the stimulus question. This can be used as the expansion request, to indicate to the child that his response is incomplete or in error and that he should reformulate the response. It is less specific than the expansion request because the child is not told that anything has been omitted from his utterance. This prompt can also be used as a means of stabilizing and reinforcing a correct response. The repetition request typically takes the form "Tell me that again" or "What did you say?" For example:

Stimulus Question	Target Response
What did he do?	He went to the store.

Interchange

Child: He goed to store.
Clinician: What did you say?
Child: He went to the store.
Clinician: Again.
Child He went to the store.

Although on the surface this appears to be more specific than the two prior techniques, our experience has shown that verbalizing the child's error before the child can respond consistently to expansion and/or repetition requests is confusing. At an early stage it appears that a child uses the repetition of his error utterance as a model to be imitated rather than as a clue to his error, and this should be avoided.

6. Self-Correction Request. The clinician asks the child whether his response was correct or incorrect. This is a less specific prompt than repeating the child's error and, as the repetition request, can be used in two ways. When a response is in error a self-correction request can be used to stimulate reformulation and correction. This prompt can also be used to stabilize and reinforce correct responses. In the latter instance the child may merely affirm the correctness of his response. The self-correction request usually takes the form "Is that right?" or "Is your answer right?" For example:

Stimulus Question	Target Response
Is he going home?	He is not going home.

Interchange

Child: He not going home.
Clinician: Is that answer right?
Child He is not going home.
Clinician: Is it right now?
Child Yes.

7. Rephrased Question. When there have been several intervening interchanges between the stimulus question and the elicitation of the correct target response it is effective to restate the original question or rephrase the question to re-elicit the target response. Often a question form simpler than the original is used. This new question may elicit an imcomplete response but generally the response moves in the direction of a closer approximation of the intended target. The rephrased question is also a means for stabilizing a correct response to the stimulus question. For example:

Stimulus Question	Target Response
What did Bobby do?	Bobby went to the circus.

Interchange

Child: Bobby go to the circus.
Clinician: Went.
Child: Bobby went to the circus.
Clinician: Did Bobby go to the circus?
Child Yes, Bobby went to the circus.

For purposes of illustration in the above discussion each elicitation technique has been used in isolation. In clinical application the clinician might use a combination of these techniques to elicit the desired response. Interactive Language Development Teaching allows a clinician considerable flexibility in deciding how to handle any one interchange with a child. Individual children respond differently to the variety of interchange techniques, and the clinician must select appropriate procedures for each child. The clinician must also use her own judgment in deciding how long to persist with a single interchange and when to accept a less-than-accurate target response as a child's best performance. The attention of the group may be lost during an unduly long interchange with one child, and that must be avoided.

EVALUATING THE LESSONS

The refinement of any clinical technique is directly related to the adequacy of objective assessment of both the children's and the clinicians' performances. The extent and rate of children's learning must constantly be reassessed so that future lesson-planning will be appropriate to their progress. Likewise, the clinician must submit her clinical performance to systematic analysis so that her effectiveness may be increased.

Evaluating Children's Progress

It is important to judge a child's progress not only by his performance during the lesson periods but in a setting quite apart from the clinic classroom. Progress should be assessed not only by his response to structured lessons, but by the quality of his spontaneous speech in conversation with and adult, using novel stimulus materials. The Developmental Sentence Scoring procedure, which evaluates a child's grammatical development from a tape-recorded language sample, affords this kind of objective assessment. Previous research on the temporal reliability of repeated application of the DSS procedure indicates that it may be used at intervals as brief as four months. The over-all performance on the DSS language sample allows a clinician to quantify the general level of grammatical usage in spontaneous speech. The child's DSS score can be compared directly to the chart of norms for children between 2-0 and 6-11 years of age. By plotting

a single child's successive DSS scores on the norm chart, his rate of language growth can be compared with children of his same chronological age or with children at his same stage of language development. A set of cumulative DSS scores, thus displayed, gives a picture of a child's language growth during the remedial training period and provides strong evidence of the effectiveness of the clinical teaching.

The information which is most useful in planning clinical remediation is derived not from the overall DSS score, but from an analysis of the language sample by grammatical category. The clinician should examine the entries in each DSS category and ascertain the items which the child is correctly formulating. Within the sample it is important to determine the percentage of the correct usage of specific structures. Once a child is spontaneously formulating a language structure correctly fifty percent of the time, it is no longer necessary to give it primary emphasis in the remedial program. This structure may continue to receive emphasis, however, at a secondary level or in combination with other structures.

The next step is to examine the attempt entries within each category of the DSS which were incorrect. These are strong indicators of the child's language needs. They indicate that the child has or is developing a concept for which he does not have an appropriate syntactic or morphological form. These attempts should guide the clinician in selecting future remedial goals. Another factor which should be examined is the DSS categories which the child does not use. Remedial work in these categories should begin at the receptive level, since the child has not indicated concepts underlying their usage.

Another way in which a child's progress can be evaluated is in the type of prompts which are required to elicit the target structures during an interchange with the clinician. Children in beginning language training may need complete models frequently but later show that they can approximate the target structure with only a repetition request or with the clinician's repetition of the error. Sometimes a child may correct himself spontaneously or may give even more information than the target response required. Over a series of lessons the clinician should look for movement away from the earliest types of prompts to more subtle prompting. When a child continues to rely on the most explicit types of prompts over a long period of time, it may indicate that the level of difficulty of the target utterance is inappropriate. When a child is responding consistently to less explicit prompts, it indicated need to increase the length or level of maturity of the syntax in the target response. The clinician should consistently upgrade the child's formulation skills by moving through levels of difficulty both in terms of reliance on prompts and in the demands of the response requirements.

Another gauge of progress in language learning is the child's ability to utilize the treatment structures in variations of the target utterance. These variations take the form of unique sentences with these structures and, a more common occurrence, self-expansion of the desired target. Another indication of the child's facility with the newly learned structures is his demonstration of self-monitoring through spontaneous self-correction. Some children appear to do more self-correction, while other children evidence more expansion behavior. This is another example of the individuality children demonstrate in learning. The related creative activity and other nonstructures periods in the lesson provide an opportunity to assess informally a child's use of language structures. When a child evidences appropriate usage of primary emphasis structures in nonstructured activities, this should be a clear indication to the clinician to move forward in lesson-planning.

Group performance may be analyzed by combining and charting the performance of the individual children. In addition, the clinician should take note of the general pattern of group behavior. In order to judge whether the story plot is being understood and whether high interest levels are being maintained, a clinician should note whether the children are able to resolve logical questions from clues in the narrative and whether they develop hypotheses or speculate on what is going to happen next in the story. Another index of group performance is the degree of participation of all children in the lesson, as indicated by the tempo of response. It is immediately obvious to an observer or reviewer of an audiotape of a lesson when the lesson is dragging.

Evaluating Clinician Effectiveness

While the obvious measure of a clinician's effectiveness is in the progress of the children whom she is teaching, there are other ways in which her performance can be evaluated. It is possible to chart the types of elicitation techniques in the order they are used by the clinician within each interchange with a child. This information identifies those prompts which are most effective for each child and indicates when a clinician is not capitalizing on the basic treatment method of moving the child from reliance on explicit prompts to more subtle forms.

Chart 4 shows the Interchange Chart, which lists the various types of prompts a clinician can use as interchange techniques. They are displayed in a left-to-right order of diminishing amount of help a child receives from the clinician. For example, the most helpful kind of prompt, after the Stimulus Question, is the Complete Model, which is the target sentence repeated again by the clinician for the child to produce. The Reduced Model gives less help; Expansion Requests and Repetition Requests give no help at all in remodeling the target structure. The clinician's Repetition of Error requires the child to recognize his own mistake in her speech, and the Self-correction Request gives no hint as to what the error was. The Rephrased Question is the least helpful of all, for it merely asks the Stimulus Question over again, and that was the source of the initial failure. The interchanges between the child and clinician are numbered and classified on the Interchange Chart according to the type of prompt which was given. The child's success or failure to produce the target structure is noted as a + or - after the number of the interchange. Through this charting one can identify clinicians who consistently use one or two methods of eliciting a response, regardless of their effectiveness. One can also identify clinicians who persist with the same prompt when it is not eliciting the desired behavior.
To illustrate the use of the Interchange Chart, the following interchanges have been recorded on Chart 4.

Interchange A

Clinician: Karen says: I'm hot.
What can we do?
I want to cool off.
I don't want to be hot.
I don't like being hot.
What does she say, Anthony?
Anthony: What can we...What Karen have for cool off?
Clinician: What can we do?
Anthony: What can we do for cool off.
Clinician What can we do to cool off?
Anthony: What can we do to.....
Clinician: You're right. What can we do to cool off.
Anthony: What can we do to cool off.

INTERCHANGE CHARTING WITH INTERACTIVE LANGUAGE
DEVELOPMENT TEACHING

CHART 4

Interchange	Stimulus Question	Complete Model	Reduced Model	Expansion Model	Repetition Request	Repetition of Error	Self-Correction Request	Rephrased Question
A	1-	3-4+	2-6-	7+	5-			
B	1+				2+			
C	1-	2+			3+			
D	1-				4+	2+	3+	
E	1-		3+			2+		4+

*The numbers on this chart indicate the order of usage of the elicitation techniques. The + and - notation indicates a correct or incorrect response from the child.

Clinician: Very nice. Tell me that one more time.
Anthony: What can we do.....
Clinician: What can we do to.....
Anthony: What can we do to.....
Clinician: Tell me the whole thing.
Anthony: What can we do...to cool off.
Clinician: Good.

Interchange B

Clinician: Timmy and Karen ran into the house.
They ran into the house.
They found mommy.
Timmy says: Mommy, we are hot.
It's very hot outside.
We want to cool off.
But we don't know what to do.
We don't know what we can do.
How should we cool off?
We don't know what to do.
What did he say, Wendy?
Wendy: We don't know what to do.
Clinician: Very Good. Tell me again.
Wendy: We don't know what to do to cool off.
Clinician: Very nice.

Interchange C

Clinician: What did he say?
What did Timmy say, Mark?
Mark: What could we do cool off.
Clinician: Almost.
He said: We don't know what to do.
Mark: We don't know what to do.
Clinician: Tell me again.
Mark: We don't know what to do.
Clinician: Good.

Interchange D

Clinician: Mommy says: I know
I know what you can do.
I'll help you cool off.
I know what you can do.
What does she say, Anthony?
Anthony: I know what can do.
Clinician: I know what can do?
Anthony I know what you can do.
Clinician: Was that right?
Anthony: Yes.
Clinician: Good. Tell me again.
Anthony: I know what you can do.
Clinician: Very nice.

Interchange E

Clinician: Timmy and Karen and Bobby ran through the sprinklers.
They weren't hot any longer.
They were cooling off.
They were having lots of fun.
They weren't hot any longer.
Were they still hot, Wendy?
Wendy: They wasn't hot any longer.
Clinician: They wasn't?
Wendy: They were not hot any longer.
Clinician: Good. They weren't.
Wendy: They weren't hot any longer.
Clinician: Were they hot, Wendy?
Wendy: No, they weren't hot any longer.
Clinician: Good.

For example, in Interchange A, the child failed to respond accurately to the Stimulus Question (1-) and also failed to respond accurately to the Reduced Model (2-). The clinician then wisely went to the most helpful interchange technique, the Complete Model, and the child failed on its first presentation (3-) but succeeded on the second attempt (4+). The clinician did not stop there but proceeded to give the more difficult Repetition Request, which the child could not do (5-), nor could he accurately produce the structure from the more helpful Reduced Model (6-). He then performed accurately on an Expansion Request (7+), after which the clinician returned to the story. This clinician correctly judged the child's inability to cope with more subtle interchange techniques and returned to more helpful types of prompts when necessary. She did not persist in prompting him at one level only, but actively aided the child in producing the desired target structure by giving him many kinds of cues.

In Interchange D the child was capable of success with the subtler forms of prompts. Although he failed to produce the target structure accurately in response to the Stimulus Question(1-), he was able to correct it when the clinician gave a Repetition of Error (2+). In order to give him a little more practice, the clinician then went to more difficult prompts, the Self-correction Request (3+) and the Repetition Request (4+), before returning to the story.

The child in Interchange E was also able to make use of the more subtle prompts. Although the Stimulus Question (1-) was answered incorrectly, the clinician's Repetition of Error (2+) elicited it. The clinician then gave the contracted form of the target structure in a Reduced Model (3+), which was also successful. Before returning to the story, the clinician gave the most demanding prompt of all, the Rephrased Question (4+), which was answered correctly. Thus, the child had several opportunities to produce the target structure under a variety of elicitation conditions.

This kind of charting of a clinician's performance can best be done by the clinician herself from a videotape, where she can see and evalutate her own clinical style. It can also be done by observers who are familiar enough with the procedure to keep up with the tempo of the lesson. It can be done informally, but less successfully, from recall of the sequence of events within a lesson, but even so, it provides a clinician with guidelines for the moment-to-moment interchange with children. In reviewing the lesson, the clinician's effectiveness should be juged on the following points:

1. Did the clinician always provide feedback to the children? An interchange should not end without some indication of the child's success or lack of success. this is particularly important at the end of a lengthy interchange.

2. Did the clinician reinforce only correct responses of the children? Clinicians can inadvertently reinforce an incorrect response with a sterotyped "OK" or through nonverbal cues such as head-nodding and smiling. A particular danger is in reinforcing unintelligible or ambiguous responses where the criteria of the target sentence were not clearly met.

3. Did the clinician pursue a target response by using appropriate prompting techniques in the interchange? The goal of each interchange is the accurate formulation by the child of the target response specified in the lesson. Sometimes a clinician may move on to another child too quickly if a target response is not immediately correct. A child should be given more than one opportunity to formulate the target sentence. Sometimes the clinician may use inappropriate prompting procedures so that the child is not really aided in giving a correct response. The clinician may discover that she has been relying on only one or two prompting techniques so that her lesson administration has become sterotyped and

repetitious. She may discover that she is using too subtle or complex prompts for a child to be successful or that she is not increasing the level of difficulty for those children who are capable of responding to more subtle prompting techniques.

4. Did the clinician modify the demands of the target response for indidividual children? Rigid adherence to the specified response is not always desirable. When it becomes obvious that the child is unable to formulate the exact target, the clinician must determine what is an acceptable response for him. A child with a word retrieval problem may not be able to call up the specific lexical items in the target, but he may give a response which contains the correct grammatical features being stressed.

5. Did the clinician repeat the target sentence when she called upon a second child? During an interchange with one child, the initial target sentence may fade from memory or go through so many variations that succeeding children would not have success in producing it. As the clinician proceeds from one child to another, it is often advisable to repeat the target again before asking the question. Thus, children's memories are refreshed and their chances of success are increased.

6. Did the clinician provide adequate opportunities for response from each child in the group? Note should be made of the number of times each child responded per session and of the amount of the clinician's time devoted to each child. There may be discrepancies in this distribution in an individual story presentation, but the distribution should be equal over a series of three or four lessons.

7. Did the target responses planned in the story adequately challenge the children's formulation ability? When high percentages of correct responses to initial stimulus questions occur, it indicates that the structures selected for treatments are already in the children's usable grammar. This may be desirable occasionally as a review, but the purpose of Interactive Language Development Teaching is to induce new language usage.

As part of this project sixty-two sample lessons which illustrate the story format of Interactive Language Development Teaching were developed. These stories are published in the Lee, Koenigsknecht, and Mulhern text (1974), and show the types of themes and language structure combinations which have been found clinically useful. A complete transcript of an applied story-lesson is provided in their text. They caution that their particular set of stories should not be considered as a workbook for a clinician to follow rigidly with any individual child or with a group of children. There is no assurance that any child would progress at the same rate of grammatical development which these stories exemplify. Some children would progress more slowly and would need many additional story presentations designed for the early developing structures; other children would probably skip the early stories entirely and begin with the more advanced ones. The stories are presented as suggestions to clinicians for writing and presenting their own lessons and as models to follow in organizing grammatical structures into a systematic developmental order.

The stories are divided into two levels. Level I stories emphasize the acquisition of basic sentence structure and the earliest grammatical forms used by normally developing children. Level II stories introduce grammatical forms which are developed somewhat later, and they also stress the combination of several grammatical structures within a single sentence. While the main purpose of these stories is to teach grammatical structure, considerable thought has been given to the underlying concepts and contentive vocabulary which they incorporate. These itmes are listed at the beginning of each story along with the materials suggested as visual aids to the story presentation. For the clinician's convenience, those grammatical structures which receive primary and secondary emphasis are also listed at the outset.

LEVEL I STORIES

Level I stories contain the earliest developing forms contained in the eight grammatical categories of the DSS. Stories 1 through 5 emphasize the formulation of simple, grammatically correct sentences and provide opportunity to practice the correct word order of subject-predicate combination.

Pronoun

In the first stories nouns are elaborated into short noun phrases and are sometimes replaced with items from the indefinite pronoun category (it, this, some, someone, something, one, two, all) or with personal pronouns (I, he, his, she, her).

Main Verb

Since many children at this early stage of sentence development use uninflected verb forms and tend to delete copular and auxiliary be, Level I stories give considerable emphasis to these items. The clinician may find it necessary at first to accept the reduced He running in place of the target sentence He is running, but after the child has achieved the -ing, the complete is + verb + ing should be introduced.

Negative

Stories 8 and 9 in the treatment text introduce the first level of negatives in the DSS: it, this, that + is + not. In this construction the is may be either the copula or the auxiliary, but we have found that children respond more quickly to the copular form. For this reason the combination of not with auxiliary is is not stressed until Lesson 26. The grammatical goal is to stabilize the location of the negative and to attach it syntactically to the verb. Short sentences of no more than four words are used, and often the target response is reduced to No, it is not. Practice with these incomplete targets has been found useful as an introductory step to the production of complete negative forms. In order to limit sentence length to four words, a general sequence of negative expansion would begin with negation with color or possession (It is not red, This is not mine), negation with locative words (It is not here, It is not inside), and negation with proper nouns (This is not Bobby). The inclusion of a predicate nominative brings the sentence length to five or more words (This is not my ball, It is not a red wagon) and presents a more difficult formulation task. Lesson 6 includes the negative with the copula as a secondary goal, and Lessons 8 and 9 give it primary emphasis.

In stories 24 through 30 of the Lee, Koenigsknecht, and Mulhern work additional negative forms are introduced. Negatives with modal and obligatory auxiliaries in the contracted forms (can't and don't) are stressed. These negatives occur frequently in the spontaneous speech of young children, often in incomplete or sterotyped utterances (I can't, I don't know). Both can't and don't are introduced in Level I stories; don't is stressed before can't because of its relatively higher frequency of occurrence in children's speech. Imperatives, imcomplete, and sterotyped utterances are used to introduce these negative forms. Complete sentence formulation and the combination of can't and don't with a variety of lexical verbs are then developed.

Conjunction

The conjunction and occurs frequently in Lessons 1 through 11, but not always in a complete sentence. Since sentence length must be limited in early lessons, and is used in noun + noun, verb + verb, adjective + adjective, or adverb + adverb constructions (Mommy and Daddy, cat and dog, come and see, big and heavy, fast and slow). As the child begins to stabilize his use of and

at this level, reduced targets can be expanded to complete sentences (I see Mommy and Daddy, The truck is big and heavy). The introduction of and involves the semantic recognition of additivity, thus paving the way for the appearance of plural pronouns and plural verbs (Mommy and Daddy are here, They are here). The introduction of and as a conjunction between sentences is not made until Lesson 12, and even there reduced target sentences are used (He is and she is, Bobby is running and Karen is running). Considerable increase in sentence length is required when and joins two complete basic sentences (Bobby is walking home and Karen is walking to school). The last two stories in Level I introduce the conjunction but, which is used to join sentences with parallel structure but with oppositional meanings. Often negation is required in the second sentence, making this construction more difficult (The dog is big but the puppy isn't big). No other conjunctions are introduced in Level I stories.

Later Developing Forms

Stories 12 through 30 of the treatment book introduce three grammatical categories which are variations of the basic sentences used in the earlier stories: secondary verbs, interrogative reversals, and wh-questions. The first ten stories lay the groundwork for the introduction of these structures by presenting them receptively within the story contexts, but they do not become lesson goals until the children have stabilized basic sentence structure.

Secondary verbs. Early infinitive forms are contained in stories 12 through 20. Normally developing children show early use of infinitives following the lexical verbs, want, go, got, and let. In conversational speech the infinitive marker is usually elided into wanna, gonna, and gotta, while let becomes lemme or let's. Four of these early infinitive forms are introduced in Level I stories; the structure gotta is excluded because its correct formulation requires auxiliary have (have got to), which is a later developing verb form. The introduction of infinitives should begin with wanna, lemme, and let's, where self-reference is the subject and where no other verb inflection is required (I wanna, Lemme see, Let's play). Sentence length can be controlled in these early constructions and can be expanded gradually to include inflections of the main verb (I wanted to, He's going to). When these main vero elaborations are introduced, the clinician should then emphasize the articulation of to as a seperate word (I want to, He is going to), eliminating the early contracted forms (wanna, gonna). Lesson 23 domonstrates this step.

The infinitive form, gonna or going to, adds an important semantic dimension to a child's speech, since it is usually the first means he has of marking the future in verbs. Shildren use this form much earlier that they use the modal verb will. The concept of futrue is best presented to clinical children through the use of gonna, and stories 12, 14, 27, and 28 introduce it with secondary emphasis before assigning it primary emphasis in stories 29 and 30.

One other infinitive form is introduced in Level I: the noncomplementing infinitive, which is used with intransitive verbs (He is ready to go, This is fun to do), or which is used to express purpose (He stopped to play, He opened the door to look). The infinitive of purpose is a precursor of more difficult structures involving dependent clauses, and it lays the semantic groundwork for the conjunction so (He stopped so he could play, He opened the door so he could look). The non-complementing infinitive is introduced with secondary emphasis in story 17 and with primary emphasis in story 24.

Interrogative reversal. One of the most important early developing linguistic concepts is that of the question, and questions comprise a large percentage of the spontaneous utterances of young children. Correct formulation of questions

depends on reversal of the subject of the sentences and the first auxiliary verb. In these lessons the introduction of the interrogative reversal is delayed until the child has had considerable exposure to the copular and auxiliary is in declarative statements. The first step in teaching questions is the reversal of the copula (Is it Timmy?), which receives primary emphasis in stories 18 and 24 and secondary emphasis in stories 17, 19, and 23. The reversal of auxiliary is (Is he going in the water?) is introduced somewhat later, receiving primary emphasis in stories 27 and 29 and secondary emphasis in stories 26 and 28.

Wh-question. In the wh-question form, the child must learn not only the interrogative reversal but also the appropriate selection of the wh-word. Adequate receptive preparation is critical to an understanding of the wh-vocabulary. The wh-words develop largely on a semantic basis, who and what differentiating human from nonhuman characteristics, where representing location, etc. Who and what are introduced first because they can take the subject-slot in a sentence and, therefore, do not add to the length of early sentences (Who is it? What is it?). Where is the second wh-question to be presented, and its use should be restricted to sentences of four words (Where is the ball? Where is my hat?). Once a child is able to formulate wh-questions with the copula, reversal of the auxiliary is is introduced (What is he watching? Where is he going?). A child should have some experience with the interrogative reversal of auxiliary is in yes-no questions (Is he watching TV? Is he going home?) before adding the further complication of the wh-word selection. Stories 18 through 24 and also 28 and 29 emphasize wh-questions.

LEVEL II STORIES

Level II stories developed by Lee, Koenigsknecht, and Mulhern (1974) emphasize the intermediate structures contained in the eight grammatical categories of the DSS. Stories at this level also emphasize combinations of structures at all the DSS levels. Considerable emphasis is given to plural pronouns and to elaborations of the main verb: copular and auxiliary is, am, are, was, and were; -s and -ed tense markers; irregular past tense; modal verbs can and will; and obligatory do. In Level II stories the emphasis is no longer primarily on word order or simple sentence formulation but on expanding the child's repertoire of language structures and giving him a variety of ways to express his ideas. Compound and complex sentences, and with them increaseing sentence length, take on importance at this stage of teaching.

Indefinite Pronoun

The indefinite pronouns some, all, somebody, someone, something, and another, which were merely introduced in Level I, now receive primary emphasis in stories 2 through 4. This use of indefinite pronouns and quantifying words sets the stage for the introduction of the negative pronouns (nothing, nobody, none, no one), giving the child a new way of making a negative statement. At Level I, only the negation of verbs appeared; now the child is taught to negate the pronoun. At this point the child begins to learn the rule governing negation in standard English, that only one negative word negates the entire sentence. He is taught to use a negative pronoun in sentences where the verb is not negated (Nobody was home). The common error of the double negative inevitably arises, and children often try to negate both the pronoun and the verb (Nobody wasn't home). Children can be helped to discover the underlying negative rule by repeatedly constrasting examples of both forms (He had no more cookies; He didn't have any more cookies).

The negative pronouns inevitably lead to the introduction of the indefinite pronouns any, anyone, and anything, and these forms are stressed in stories 17 and 18. Any and anything are stressed with verb negations such as isn't, can't, and won't, and it is best to introduce these forms in sentences where they occur as the last word (I don't have any. I can't see anything.). The other indefinite pronouns, every and everything, are introduced after the establishment of the nothing and anything forms.

Personal Pronoun

Groundwork was laid for the introduction of plural pronouns in Level I, where and was used as the conjunction between two nouns. Level I forms such as Mommy and Daddy and the dog and the cat are presented in Level II with the appropriate plurals (we, us, our, they, them, their). The use of plural pronouns inevitably leads to further verb elaborations and the problems of subject-verb agreement; thus, plural pronouns and additional verb forms must be taught simultaneously. If the child has stabilized the use of the copular and auxiliary is, then the shift to am and are is not too difficult and can be accomplished by stressing the number and person characteristics of the subject and linking these with the appropriate verb forms. Learning may be facilitated by contrasting singulars and plurals within the same story (He is, They are).

Reflexive pronouns are introduced in story 16. The most common usage of reflexives in children's language is in sentences such as I did it by myself and He went all by himself. In such a construction, the child is learning even more

than the use of a reflexive pronoun; he is also learning the preposition by as the marker of an agent, the initiator of action. This form will be used at a much later time in the development of passive sentences, such as He was hit by a car. The clinician may facilitate the later learning of this very mature structure, the passive, by introducing the reflexive in the form by myself.

Main Verb

Modal verbs can and will and the obligatory do are introduced in story 1. These auxiliaries take the same privilege of occurrence in verb elaborations and are taught together. Will is introduced as a replacement for the earlier form, is gonna, and its meaning will be made more clear to the child if the two future forms are presented interchangeably. Can and do usually appear first in their negative forms, can't and don't, in normal language development, and this sequence should be observed also in clinical teaching. When a child has had some success with can't and don't, then sentences with can and do may be presented. Tense markers on auxiliary verbs are first introduced with modals in story 18, then with obligatory-do in story 26, and they are used in negative and interrogative sentences.

The final primary verb elaborations stressed in Level II are the use of the auxiliary have (have eaten), the modal must (must go), and the use of more than one auxiliary (he might have been). These forms are seen very late in the normal development of syntax and often are omitted entirely from a clinical teaching program. Were it not for its critical role in the common verb form have got, have might not be introduced at all in these lessons. These late developing verb elaborations are presented for illustration in stories 23, 28, and 29, where they are used both with negatives and with questions.

Secondary Verb

Whereas the secondary verbs in Level I were largely the early developing infinitives, Level II introduces another secondary verb, the participle, in stories 5 and 6. Participles are verb forms which fulfill an adjectival function and may be considered as one means of joining two basic sentences. Present participles are introduced first and are placed as the last word in the sentence (He sees the house burning). The participle form can be increased in difficulty by placing it prior to the noun (He sees the burning house) or by expanding the participial phrase (I see a man playing a horn).

Infinitival complements are introduced in stories 10 and 11. These are not the early infinitives of Level I, but are complements of other lexical verbs (try to, have to, like to, ought to, etc.). These infinitives provide still other ways for children to combine basic sentences, and the sentences which result are much shorter than sentences joined with conjunctions. Further steps in the development of infinitives are the use of subjects other than those used with the main verb (I want you to come) and a wh-word followed by an infinitive (I know how to swim). These forms should be reserved for fairly advanced language development groups.

The gerund is a verb form used as a noun and, like participles and infinitives, the gerund combines the information contained in two basic sentences. Gerunds are infrequent in the speech of young children and when they do occur, they are apt to be used with go (go fishing, go swimming) or in a wh-question form (How about going with me?). Story 26 contains some examples of the gerund with go, and story 22 introduces it with how about.

Negative

Stories 7 through 9 introduce the negative contractions isn't and won't. The use of is not with it, this, and that as subjects was introduced early in Level I, but never in a contracted form. Isn't is a difficult word to articulate and its introduction should be delayed until the clinician is sure that the child has stabilized the use of is and understands the concept of negation. Won't can be introduced once the concept of future has been established, first through gonna and then through will. In story 20, uncontracted negatives receive emphasis with such forms as can not, do not, and will not. Since the normal pattern of language development shows the early appearance of negative contractions, the clinician should delay the use of uncontracted negatives until the child has shown considerable success with the common contractions. Stories 23 and 29 introduce the latest appearing negative form, the negation of auxiliary have.

Conjunction

The early conjunction and was introduced at Level I, but is necessarily reintroduced in the Level II stories which stress plural pronouns and verb forms. Compound subjects (Tommy and Betty, you and I) develop into plural forms (they are, we were) and are used to clarify and explain them. More mature conjunctions (if, so, or) are introduced into the stories in the last half of Level II. These conjunctions involve greater sentence length and must, therefore, be used cautiously. Moreover, the semantic relations which these conjunctions express must be made very clear in the story context; their meanings must be motivated by situational events. The conjunction if introduces the concept of conditionality and allows the child to express ideas not founded on actual experience. If is important in the expression of imagination, hopes, and wishes, an important semantic step in language usage. The conjunction so introduces the concept of purpose, which has already been presented in the noncomplementing infinitive (He opened the door to look. He opened the door so he could see). The conjunction or presents a situation where there is a choice, and a child must understand the concept of alternatives if he is to use this word. Or can initially be presented as a conjunction between two nouns (Karen or Bobby will go, We can go on the swings or the slide) in order to keep sentence length to manageable proportions. The simultaneous teaching of the wh-word which, at least at the receptive level, appears to facilitate the learning of or (Which do you want, the red or the green?)

The conjunction because embodies one of the most semantically powerful concepts which children encounter since cultural patterns of causality, purpose, and motivation are often revealed to them in this form. Prior to the use of because between clauses, a child is taught to respond to why-questions with only the dependent clause and the starter word because (Why did he go? Because he was hungry). Once the relationship of why to because is firmly established, the two-clause sentence is expected in the target response (Why did he go? He went because he was hungry).

Interrogative Reversal

Simple reversals of the copula and auxiliary is were first presented in Level I, but Level II stories contain more mature interrogative forms. The reversal of modal verbs and obligatory-do forms are given primary emphasis in lessons 12 through 15 and again in the last two lessons. The children's target responses are limited to the obligatory-do form (Do you want to ride?), but the

narrative presents reversals of obligatory-does and did as well (Does Bobby want to ride? Did he do it?). These more difficult forms could be used as target responses by a clinician who thought that tense markers on these auxiliaries would not create too difficult a formulation task. The most mature interrogative reversals are with the auxiliary have (Have you seen him?) and with two or more auxiliaries (Can Mommy still be sleeping?), and they are not presented until lessons 28 and 29.

Wh-question

Late developing wh-words are not introduced until the interrogative reversal of most auxiliary verb forms has been established. Understanding of the semantic features of wh-words like why, how come, what if, how about, whose, which, and which one must precede expressive usage. Understanding is judged through the child's ability to respond appropriately to the various wh-question forms which elicit target sentences. For example, expressive use of why would never be taught until a child was able to respond appropriately to questions like Why was he late? When wh-words are included in the target sentences, they are usually presented as the direct quotation of bits of dialogue. Lessons 13 and 32 present wh-questions with how and when; lessons 21 and 22 emphasize why and what if; lesson 30 uses whose and which in target responses.

SECTION IV

USE OF INTERACTIVE LANGUAGE DEVELOPMENT TEACHING WITH TWENTY-FIVE CLINICAL CHILDREN

This section presents the findings of a three-year study of Interactive Language Development Teaching at the Northwestern University Speech and Language Clinics. A primary goal of this effort was to demonstrate that the theoretical formulations of a developmental model of grammar described in Developmental Sentence Analysis (Lee, 1974) and related psycholinguistic research findings, including those from cross-sectional and longitudinal normative studies with DSA procedures (Koenigsknecht, 1974), can be applied effectively by a speech and language clinician treating children with oral language problems. Central to the rationale underlying the Interactive Language Development Teaching approach is objective, continuing assessment of a child-client's use of morphological forms and syntactic structures. It is important to measure the growth in the number and maturity of such forms and structures the child is able to incorporate within an utterance. Since the goal in such clinical teaching is to present grammatical structures in sequences building upon those structures the child has already mastered, while considering the normal developmental patterns for emerging combinations of language structures, on-going assessment is necessarily prerequisite to and concomitant with treatment. In such an approach to analysis and treatment the child's spontaneous language usage is viewed as the end product of language learning. The clinician must continually analyze similarities and differences between the child-client's use of grammar in such spontaneous formulations and the typical grammatical patterns of normal children at a similar developmental stage. Such pattern comparisons permit the clinician to treat aberrant syntax in the context of a normal developmental sequence. The amount and nature of the differences in grammatical development can be operationally defined and systematically treated. A critical shortcoming of most speech and language treatment programs is the complete lack of or the inadequacy of such objective measures of the child-client's progress throughout the period of clinical training. It must be shown that the clinical child uses the grammatical structures presented in clinical lessons in the spontaneous formulation of utterances in response to stimulus materials not drilled on or used in the treatment program. In the ensuing discussion comparison of pre-treatment DSA, which revealed the language level at which these children were functioning prior to enrollment in therapy, with post-treatment DSA, which showed their level of language functioning at the end of the therapy period, is used to objectively assess the effectiveness of Interactive Language Development Teaching.

In the area of child language disabilities clinical researchers attempting to establish the effectiveness of clinical procedures face another limitation, even if they have developed useful measures of the behavior under treatment. They cannot ethically use control groups. It would be unconscionable to withhold clinical training for any period of time from any child who needs it and would likely gain from it. This precludes designs in which one group of children receives treatment while treatment is withheld from a comparable group in order to show that the treatment produced results. The beauty of the DSA procedures and normative data is that the progress of clinical children can be compared with the rate of progress of normally developing children who are at the same stage of language development. It is possible to estimate a clinical child's over-all language growth in months and compare it to the number of months the child has been in a treatment program. Clinical children have been slowed or reduced in their language development relative to normally developing children; therefore if a clinical treatment approach could effect a rate of gain equal to that of normal children, or even surpass it, the clinician could reasonably assume the effectiveness of the approach. DSA procedures along with a battery of language and psychological measures were used to assess objectively the merits of Interactive Language Development Teaching with twenty-five clinical children.

PROCEDURES

Treatment Format. Interactive Language Development Teaching was used with twenty-five children over a three-year period at the Northwestern University Speech and Language Clinics. During the course of the study there were six language groups consisting of four or five children, usually four. The typical pattern was for the groups to be seen for one-hour clinical sessions four times a week in three eight-week treatment blocks. There was generally a non-treatment vacation period of approximately four weeks between the first and second eight-week treatment blocks and again between the second and third eight-week treatment blocks. Thus, the interval between the immediate pre-treatment and immediate post-treatment testing sessions was approximately thirty-two weeks or eight months. The statistical calculation of the exact time between the pre- and post-treatment assessments revealed a mean treatment interval of 8.3 months for the twenty-five clinical children. The structure of the lessons, including the writing and presenting of the story-conversations, followed the Interactive Language Development Teaching procedures described in Section I of Lee, Koenigsknecht, and Mulhern's Interactive Language Development Teaching, 1974. Language development stories similar to those presented in Section II of that text were applied. The specific structures emphasized and the general developmental level of language structures included within a series of lessons depended upon the capabilities of the children in the group and the rate of progress evidenced in the course of treatment.

Clinicians. Seventy-five graduate students in the Speech and Language Pathology program participated in the treatment program, each for one eight-week block. Thus for each eight-week period there were as many graduate student clinicians involved in the program as there were children in the group, usually four. Thus, typically each clinician on a rotating basis conducted every fourth group story-lesson. All clinicians had completed at least one course in child language development prior to involvement in this project. All lessons were under the direct supervison of a faculty clinical supervisor holding the master's degree in Speech and Language Pathology.

The extensive pre- and post-treatment speech and language measures were taken by an examining speech and language pathologist, at the master's degree level, not directly involved in the treatment program. A clinical psychologist, at the doctoral degree level, experienced in assessing functioning in language impaired children also conducted pre- and post-treatment assessments.

Children in training. Interactive Language Development Teaching was used with twenty-five monolingual children from middle-class homes in the North Shore area of Chicago. The children were in the preschool age range of three years, two months, to five years, nine months, at the beginning of their treatment period. The mean age of the twenty-five subjects at the beginning of treatment was four years, 4.3 months, or 52.3 months with a standard deviation of 5.1 months. The mean age of the twenty-five subjects at the end of the treatment period was five years, 0.6 months, or 60.6 months. All the children included in this study had normal hearing, evidenced no general neuromuscular problems, and were within the range of normal on selected intelligence measures. All of the subjects evidenced reduced expressive language functioning. The mean delay in grammatical development for the twenty-five subjects on their pre-enrollment language sample, as estimated with DSA procedures, was twenty-one months.

Pre- and post-treatment clinical measures. The twenty-three pre- and post-treatment tests and subtests included in this analysis were: Developmental Sentence Scoring (Lee and Canter, 1971; Lee, 1974), Northwestern Syntax Screening Test - Receptive and Expressive Sections (Lee, 1969), Peabody Picture Vocabulary Test (Dunn, 1959), Stanford-Binet Intelligence Scale Form L-M (Terman and Merrill, 1960), Preschool Attainment Record (Doll, 1965), Spencer-McGrady Sentence Repetition (Unpublish-

ed test of ability to repeat sentences in increasing length with generally increasing grammatical load - items from Spencer, 1958 and McGrady, 1964), Oral Commissions Subtest from Detroit Tests of Learning Aptitude (Baker and Leland, 1967), Illinois Test of Psycholinguistic Abilities - Total and Individual Subtests (Kirk, McCarthy, and Kirk, 1968), Draw-A-Man Test (Harris, 1963), Developmental Test of Visual-Motor Integration (Beery and Buktenica, 1967), Memory Span for Digits Forward, Northwestern Articulation Proficiency Test (Canter and Collins, Unpublished Research Edition). Separate consideration was also given to the group's performance within individual component categories of the DSS, the mean developmental scores or mean scores per entry within the DSS grammatical categories, and the number of entries per sentence within the DSS grammatical categories.

FINDINGS

Pre-treatment measures. Obtained means, standard deviations, and minimum and maximum values for the raw scores on the twenty-three pre-treatment clinical measures are presented in Table 33. A similar listing of the means, standard deviations, and minimum and maximum values for the age-equivalent scores listed in months for sixteen of these pre-treatment measures are contained in Table 34. For the twenty-five pre-treatment clinical cases the DSS ranged from 1.30 to 7.66 with a mean DSS of 3.84 and standard deviation of 1.53. The mean estimated age-equivalent score in months on the DSS was 31.3, with a standard deviation of 7.9. Thus, as estimated by the over-all DSS, the average delay in grammatical development for these children was twenty-one months upon their enrollment in the treatment program.

Substantive reductions in performance were evident on the two other expressive language tasks which place some demand on the syntactic skills of the subjects, namely the Expressive Section of the NSST, with a group mean score more than two standard deviations below the mean score expected of three year old children, and the Spencer-McGrady Sentence Repetition measure, with a mean score substantially below that expected of four year old children.

The group performance was clearly below age level expectations on the two measures of auditory sequential memory. The mean pre-treatment performance on the Memory Span for Digits Forward was less than the three-digit span normally obtained by three year old children. Performance on the Auditory Sequential Memory Subtest of the ITPA was reduced by nearly a full year relative to age level expectations. The sequential memory difficulties seemed specific to the auditory modality, with scores on the Visual Sequential Memory Subtest of the ITPA at a level appropriate for the chronological age of the children.

These clinical children generally did poorly on the pre-treatment application of the Grammatic Closure Subtest of the ITPA. These items tap primarily the usage of various morphological forms in a sentence completion picture-explanation task.

Two other measures which displayed a general impairment in the speech and language skills of these clinical children were the Receptive Section of the NSST and the Northwestern University Articulation Proficiency Test. On the NSST - Receptive Section, a screening instrument which samples comprehension of selected syntactic structures, the mean score for the group was more than one year below the group's mean chronological age.

It is also important to consider those measures on which these clinical cases scored at or above their age level expectations as a group. As shown in Tables 33 and 34 the obtained means on the Stanford-Binet Intelligence Scale, the Illinois Test of Psycholinguistic Abilities - Total Score, and the Preschool Attainment Record were at a level appropriate for the chronological age of the children. Subjects' pre-treatment intelligence quotients as computed from the Stanford-Binet Intelligence Scale ranged from 76 to 121 with a mean of 99.9 and standard deviation of 14.0. The children's composite performance within the range of normal on the

TABLE 33 Means, standard deviations, minimum and maximum values for raw scores on pre-treatment and post-treatment measures and difference means with t-values for comparisons over eight-month interval (25 subjects, pre-treatment mean age of 52.3 month, post-treatment mean age of 60.7 months).

Test or Subtest	Pre-treatment			Post-treatment			Comparison		
	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range	Difference Mean	t-value*	p less th
Developmental Sentence Score	3.84	1.53	1.30-7.66	6.04	1.89	3.22-9.66	+2.20	5.59	0.001
NSST - Expressive Section	7.0	9.7	0-24	12.6	9.5	3-33	+5.6	2.17	0.04
NSST - Receptive Section	21.9	5.8	8-30	25.8	4.1	16-31	+3.9	4.83	0.001
Peabody Picture Vocabulary Test	43.1	12.6	15-60	52.0	8.9	29-63	+8.8	6.99	0.001
Stanford - Binet Intelligence Test	99.9	14.0	76-121	105.7	17.8	75-142	+5.8	2.48	0.02
Preschool Attainment Record	76.0	12.0	47-96	87.8	13.6	59-108	+11.8	3.98	0.001
Spencer-McGrady Sentence Repetition	2.0	1.4	0-5	4.1	1.9	1-7	+2.1	6.54	0.001
Oral Commissions (DTLA)	11.8	4.7	2-18	15.0	2.4	6-18	+3.3	4.12	0.001
ITPA - Total Score	114.9	35.2	43-184	150.4	35.5	86-205	+35.5	7.82	0.001
Auditory Reception	13.0	6.0	0-24	18.7	7.1	7-32	+5.8	6.06	0.001
Auditory Association	13.2	5.9	1-26	16.6	5.2	7-25	+3.5	5.82	0.001
Auditory Sequential Memory	10.4	4.5	1-18	12.9	4.9	3-24	+2.5	3.01	0.01
Visual Reception	13.2	6.2	1-27	17.4	5.0	9-27	+4.2	3.52	0.01
Visual Association	12.6	5.3	1-20	16.5	5.2	3-24	+3.9	3.35	0.01
Visual Closure	9.8	4.5	0-19	12.0	4.7	5-22	+2.2	2.35	0.03
Visual Sequential Memory	9.2	4.2	0-18	10.9	4.3	4-20	+1.6	1.85	0.07
Manual Expression	15.8	6.4	4-29	18.0	6.0	6-29	+2.2	2.24	0.04
Verbal Expression	11.5	3.6	5-19	16.1	6.0	6-27	+4.6	4.51	0.001
Grammatic Closure	6.8	4.5	0-17	11.8	4.1	4-20	+5.0	5.09	0.001
Draw-A-Man (Goodenough-Harris)	4.7	3.2	0-11	6.2	3.0	0-10	+1.5	2.97	0.01
Developmental Test of Visual-Motor Integration	4.7	2.1	0-9	6.7	2.6	3-11	+2.0	5.07	0.001
Memory Span for Digits	2.7	1.1	0-4	3.2	0.8	2-5	+0.5	2.70	0.01
NU Articulation Proficiency Test	32.0	12.3	13-54	39.6	12.0	15-67	+7.6	3.61	0.001

* df = 24

TABLE 34 Means, standard deviations, minimum and maximum values for age-equivalent scores in months on pre-treatment and post-treatment measures and difference means with t-values for comparisons over eight-month interval (25 subjects, pre-treatment age of 52.3 months, post-treatment mean age of 60.7 months.

Test or Subtest	Pre-treatment			Post-treatment			Comparison		
	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range	Difference Mean	t-value*	p less than
Developmental Sentence Score	31.3	7.9	21-60	42.1	12.1	28-69	+10.8	5.45	0.001
NSST - Expressive Section	26.0	5.2	24-47	32.8	13.4	24-70	+6.8	2.56	0.02
NSST - Receptive Section	39.3	11.5	24-60	47.3	10.6	26-64	+8.0	3.7[illegible]	0.001
Peabody Picture Vocabulary Test	54.8	15.4	27-78	67.9	14.2	36-90	+13.1	7.18	0.001
Stanford-Binet Intelligence Test	52.7	7.8	36-70	63.0	10.1	44-86	+10.3	7.68	0.001
ITPA - Total Score	51.1	9.0	33-69	60.2	9.1	44-74	+9.1	7.62	0.001
Auditory Reception	48.0	11.1	25-70	59.5	15.4	37-90	+11.5	5.42	0.001
Auditory Association	55.8	12.6	30-87	62.3	11.1	43-84	+6.5	4.82	0.001
Auditory Sequential Memory	42.0	10.8	24-60	48.5	11.9	26-78	+6.5	3.76	0.001
Visual Reception	59.6	17.1	25-99	70.0	11.4	49-88	+10.4	3.25	0.01
Visual Association	53.7	12.2	30-72	63.5	13.3	34-86	+9.8	3.44	0.01
Visual Closure	49.6	11.7	25-73	55.0	12.2	35-81	+5.4	2.09	0.04
Visual Sequential Memory	50.0	12.3	25-78	55.2	13.6	34-87	+5.2	1.90	0.07
Manual Expression	58.7	18.1	30-99	65.0	17.7	34-99	+6.3	2.12	0.04
Verbal Expression	51.9	8.9	34-68	61.1	13.4	37-84	+9.2	3.96	0.001
Grammatic Closure	46.7	14.0	26-72	61.7	8.9	39-80	+15.0	5.32	0.001

* df = 24

ITPA and the PAR also indicated that their general level of functioning was commensurate with their chronological age. The severe expressive language problems they exhibited represented specific problems in language learning and usage.

The pre-treatment results from two basic receptive language measures were also normal. These were the Peabody Picture Vocabulary Test, a measure of receptive vocabulary for single words, and the Oral Commissions Subtest of the DTLA, a measure of comprehension of sequenced basic commissions. The requirements for comprehension of syntax on the Oral Commissions Subtest are minimal.

It is interesting to note the differences in the performance on the two subtests from the ITPA which assess expressive skills. Although the mean scores for both the Manual Expression Subtest, 58.7 months, and the Verbal Expression Subtest, 51.9 months, were appropriate for the age of the clinical group, there was a six to seven month advantage on the gestural measure. The better performance on the Verbal Expression Subtest in contrast to all other expressive language measures including the DSS, the NSST - Expressive Section, the Sentence Repetition task, and the Grammatic Closure Subtest reflects the fact that more advanced morphological forms and syntactic structures are not needed to score well on the Verbal Expression Subtest. The required task is basically to provide names for discrete, relevant and factual concepts specific to stimulus items.

Further inspection of Tables 33 and 34 shows that these clinical children achieved normal results as a group for the auditory and visual reception and association subtests of the ITPA. Another general finding was that they scored within normal limits on the three visual-motor skill measures, the Developmental Test of Visual-Motor Integration, the Draw-A-Man Test, and the Visual Closure subtest of the ITPA.

Pearson product-moment correlations were computed between the pre-treatment DSS scores and the other pre-treatment measures obtained by the twenty-five children seen for Interactive Language Development Teaching. As shown in Table 35 there were significant positive correlations between performance on the DSS and each of the four expressive language measures, with NSST - Expressive Section $r_{xy} = 0.68$, with Spencer-McGrady Sentence Repetition $r_{xy} = 0.50$, with Verbal Expression $r_{xy} = 0.66$, and with Grammatic Closure $r_{xy} = 0.45$. The two measures of auditory sequential memory were each positively correlated with the over-all DSS also, with Auditory Sequential Memory $r_{xy} = 0.51$ and with Memory Span for Digits Forward $r_{xy} = 0.40$. Positive correlations were indicated in addition between the pre-treatment DSS scores and the pre-treatment results of the PPVT $r_{xy} = 0.45$, the Oral Commissions Subtest $r_{xy} = 0.69$, the ITPA - Total $r_{xy} = 0.49$, the Auditory Association Subtest $r_{xy} = 0.36$, the Visual Association Subtest $r_{xy} = 0.39$, and the Draw-A-Man test $r_{xy} = 0.43$.

In summary, on the pre-treatment measures these clinical children were found to be functioning over-all within a normal range of intelligence but to have severe expressive language problems. Deficits in language usage were most clearly shown on measures of expressive usage of grammar. Comprehension of spoken syntax was also reduced. The difficulties these preschool children would face in school or educational settings if their oral language skills were not improved would be massive.

Post-treatment measures. Obtained means, standard deviations, and minimum and maximum values for the raw scores on the twenty-three post-treatment clinical measures are presented in Table 33. As with the earlier discussion of the pre-treatment measures a similar display of the means, standard deviations, and minimum and maximum values for the age-equivalent scores listed in months is provided for sixteen of these post-treatment measures in Table 34. Important information on the differences in performance by the twenty-five children seen for Interactive Language Development Teaching prior to and following enrollment of approximately eight months in the program is contained in both Table 33 and Table 34. Under the third general column, labelled "Comparison," the first sub-column contains information on the mean of the differences between the pre- and post-treatment scores for the clinical children, raw scores in Table 33 and age-equivalent scores in Table 34. The final two sub-columns contain a summary of the comparisons made with a correlated t-formula (Ferguson, 1971).

Table 35 Pearson product-moment correlations between the pre-treatment DSS and other pre-treatment measures for twenty-five ILDT subjects

Pre-treatment Measures	r_{xy}^{a}
NSST - Expressive Section	0.68*
NSST - Receptive Section	0.30
Peabody Picture Vocabulary Test	0.45*
Stanford-Binet Intelligence Scale	0.26
Preschool Attainment Record	0.34
Spencer-McGrady Sentence Repetition	0.50*
Oral Commissions (DTLA)	0.69*
ITPA - Total Score	0.49*
Auditory Reception	0.27
Auditory Association	0.36*
Auditory Sequential Memory	0.51*
Visual Reception	0.24
Visual Association	0.39*
Visual Closure	0.20
Visual Sequential Memory	0.01
Manual Expression	0.07
Verbal Expression	0.66*
Grammatic Closure	0.45*
Draw-A-Man (Goodenough-Harris)	0.43*
Developmental Test of Visual-Motor Integration	0.31
Memory Span for Digits	0.40*
NU Articulation Proficiency Test	0.31

* $p < .05$
a $df = 23$

Following enrollment of approximately eight months in Interactive Language Development Teaching the mean age of the children was 60.7 months. As shown in Table 33, during the treatment period there were gains in the raw scores for every one of the twenty-three measures. With the single exception of the Visual Sequential Memory subtest, on which pre- and post-treatment group performances were within the normal range, the t-comparisons revealed these gains to be statistically significant. Although improved performance on the measures might be expected with increasing age of the subjects, the rate and nature of the positive changes for these clinical children provided useful information about the ILDT form of language intervention.

An important premise central to the interpretation of the before-and-after comparisons was that clinical children have been reduced or slowed in their language development relative to normally developing children. If presenting grammatical structure with the ILDT approach effected a rate of gain equal to or surpassing the rate of progress of normally developing children who are at the same stage of language development the effectiveness of the approach would be clearly demonstrated. Developmental Sentence Analysis of the spontaneous language usage of these children following the treatment period resulted in DSS scores ranging from 3.22 to 9.66 with a mean DSS of 6.04 and standard deviations of 1.89. The mean DSS increase for the twenty-five subjects was 2.20. At the end of the treatment period the mean estimated age-equivalent score in months on the DSS was 42.1 months with a standard deviation of 12.1. The mean gain per child was 10.8 months on this objective measure of the use of morphological forms and syntactic structures in the spontaneous formulation of utterances. When this over-all language growth of 10.8 months is compared to the 8.3 months these clinical children were enrolled in treatment the effectiveness and usefulness of Interactive Language Development Teaching is supported. These results indicated that the grammatical structures presented clinically through emphasis in the story-conversations were used later by these children in their spontaneous formulations in conversation with an adult.

Substantive gains were evidenced also on the Grammatic Closure subtest of the ITPA. The obtained mean increase of 15.0 months on the expressive measure of morphological forms and grammatical features placed the performance of these clinical children within the normal range following approximately eight months of treatment. Significant gains were also shown on the Spencer-McGrady Sentence Repetition measure reflecting improved ability to repeat sentences of increasing length with generally increasing grammatical load. The two other measures which quite directly sample changes in syntactic skills were the Expressive and Receptive sections of the NSST. The mean increase in the Expressive section was 5.6 raw score points with an estimate age-equivalent gain of 6.8 months. Comprehension of syntactic structures as measured with the screening instrument was improved on the average by 8.0 months. In Interactive Language Development Teaching both the receptive and expressive uses of syntax are emphasized. These language delayed children were progressing during the treatment period, on these measures, at a rate of approximating the normal progress seen at these stages of language development.

On the pre-enrollment measures the group performance was clearly below age level expectations on both measures of auditory sequential memory. Although at the end of the treatment-study gains were evident on the Auditory Sequential Memory subtest and the Memory Span for Digits Forward, these gains were minimal and less than that normally expected during such an eight-month developmental period. The auditory sequential memory difficulties continued for these youngsters. The important finding was that these clinical children improved their use of grammar at a rate faster than normal, relative to the progress of normally developing children at approximately the same stages of language development, while operating under the continuing constraints of limiting, poor auditory sequential memory skills. The comprehension and spontaneous use of syntax improved during the course of enrollment in Interactive Language Development Teaching despite the existing auditory sequential memory impairments.

The children's post-treatment performance on the Stanford-Binet Intelligence Scale, the Illinois Test of Psycholinguistic Abilities-Total Score, and the Preschool Attainment Record was in general within normal limits for their age level. The same pattern on these three more general measures of over-all level of functioning was obtained on the pre-treatment testing. Increases in age-equivalent scores on these tests kept pace with the increase in the children's chronological ages. The mean gain in months on the Stanford-Binet Intelligence Scale was 10.3 while on the ITPA-Total Score it was 9.1. A mean gain of 11.8 raw score points on the PAR was consistent with the growth shown on the other more general measures.

Definite gains were shown in the course of treatment on the PPVT single word receptive vocabulary measure as well as on the Auditory Reception subtest of the ITPA and the Oral Commissions subtest of the DTLA. The age-equivalent increases on the PPVT, mean gain of 13.1 months, and on the Auditory Reception subtest, mean gain of 11.5 months, surpassed the amount of change expected for this period. Over a series of Interactive Language Development Teaching story-lessons considerable attention is given to concept development and receptive and expressing vocabulary expansion.

The mean post-treatment score for the Manual Expression subtest was 65.0 months, a net increase of 6.3 months, while for the Verbal Expression subtest it was 61.1 months, a net increase of 9.2 months. Although pre-treatment scores for both subtests were appropriate for the age of clinical group, there earlier had been a seven-month advantage on the gestural measure. The discrepancy between these two expressive measures was narrowed at the end of the eight month treatment period.

These clinical children had achieved normal results as a group for the Auditory Association, Visual Association, and Visual Reception subtests of the ITPA on the pre-enrollment testing. There were age-equivalent gains of 6.5 months, 9.8 months, and 10.4 months respectively on these measures at post-treatment testing. Performance on the three visual-motor skill measures, the Developmental Test of Visual-Motor Integration, the Draw-A-Man Test, and the Visual Closure subtest of the ITPA also progressed normally during this period. The articulatory skills of the children showed modest improvement during this same period. On the post-treatment assessment the mean quantified articulation age of the children was at approximately the three year age level according to the results of the Northwestern Articulation Proficiency Test.

Individual Categories of the DSS. Separate consideration was also given to the clinical cases' pre- and post-treatment performance on syntactic structures within the individual categories of the DSS. Table 35 contains the means and standard deviations of the group's pre- and post-treatment scoring within each DSS category. The measures are based upon the sum of the weighted scores for a given DSS component category divided by the number of DSS sentences in the language sample. Across a language sample it is sensitive to both the number of entries per sentence, reflective of utterance length, and the weightings assigned to the entries, reflective of the maturity of syntactic usage. Thus it is an indication of not only the developmental level or maturity of syntactic usage within the category but also the typical frequency of usage of structures within the category. Table 36 also contains a summary of the univariate analyses of variance (Winer, 1971) for the effect of treatment on each category over the eight month period.

A comparison of the pre- and post-treatment means by category revealed that group scores increased in the Indefinite Pronoun-Noun Modifier, Personal Pronoun, Main Verb, Secondary Verb, Negative, Wh-Question, and Sentence Point categories. Statistically significant increases were obtained on four individual DSS categories involving Personal Pronouns, Main Verbs, Secondary Verbs, and Sentence Points. Degrees of freedom for the comparisons varied depending upon the number of clinical language samples containing items from the grammatical category under study. Mean

TABLE 36 Means and standard deviations of pre- and post-treatment scores per DSS sentence within DSS component categories and summary of the univariate analyses of variance for treatment effect over eight-month interval (25 ILDT subjects)

Categories	Pre-treatment Mean	Pre-treatment Standard Deviation	Post-treatment Mean	Post-treatment Standard Deviation	F-Ratio	Degrees of Freedom	p less than
Indefinite Pronouns	0.89	0.42	1.07	0.31	3.00	1,48	0.09
Personal Pronouns	1.13	0.52	1.62	0.57	10.15	1,48	0.01
Main Verbs	0.77	0.45	1.45	0.65	18.23	1,48	0.001
Secondary Verbs	0.21	0.14	0.32	0.21	4.03	1,44	0.05
Negatives	0.24	0.18	0.38	0.30	2.71	1,42	0.11
Conjunctions	0.44	0.40	0.44	0.31	<1.00	1,33	
Interrogative Reversals	0.24	0.23	0.19	0.21	<1.00	1,21	
Wh-Questions	0.06	0.05	0.10	0.07	2.58	1,26	0.12
Sentence Point	0.31	0.19	0.55	0.20	19.23	1,48	0.001

scores for Conjunctions remain constant on the pre- and post- samplings of spontaneous speech. There was a slight decrease in the mean scoring for Interrogative Reversals. A similar pattern of decreasing scores on the question forms was seen in the normative studies with the DSA procedure (Koenigsknecht, 1974).

The mean score per DSS sentence within the grammatical categories shown in Table 36 involved both the developmental level and frequency of usage of the syntactic structures under study. To better understand the possible influences of Interactive Language Development Teaching upon the grammatical usage of these children two additional measures were computed. The first, which related directly to the length of a child's utterances, was based upon the number of scorable entries within each category divided by the number of DSS sentences on the language sample (Table 37). The next measure, the mean developmental score, was derived by dividing the weighted sum for a category by the number of DSS entries in that category. This is a general measure of the maturity of syntax usage (Table 38).

The means and standard deviations of the pre- and post-treatment measures for the number of entries per DSS sentence and for the mean developmental scores are listed in Table 37 and 38 respectively. Summaries of the univariate analyses of variance for the effect of treatment on each category over the eight-month period are also included. As shown in Table 37 the mean number of entries per DSS sentence increased in the Indefinite Pronouns-Noun Modifier, Personal Pronoun, Main Verb, Secondary Verb, and Negative categories. Statistical significance for this measure was obtained on three of the grammatical categories including Personal Pronouns, Main Verbs, and Secondary Verbs.

Mean developmental scores or mean scores per DSS entry increased in the Indefinite Pronoun-Noun Modifier, Personal Pronoun, Main Verb, Secondary Verb, Negative, Interrogative Reversal and Wh-Question categories (Table 38). These gains in mean scores per entry were statistically significant for Main Verbs, Negatives, and Wh-Questions. Only the mean developmental score within the Conjunction category decreased over the eight-month treatment period.

SUMMARY

Interactive Language Development Teaching was used with twenty-five clinical children over a three-year period at the Northwestern University Speech and Language Clinics. The mean age of the children upon enrollment in treatment was four years and four months. All the children included in this study had normal hearing, evidenced no general neuromuscular problems, and were within the range of normal on selected intelligence measures; however, they had severe expressive language problems. Deficits in language usage were most clearly shown on measures of expressive usage of grammar. The mean delay in grammatical development for the twenty-five subjects on their pre-enrollment language sample, as estimated with the DSA procedure, was twenty-one months. Comprehension of spoken syntax was also reduced.

Extensive pre- and post-treatment speech, language, and learning measures were taken by a speech and language pathologist and by a psychologist who were not directly involved in the treatment program. The mean treatment interval for the twenty-five children was eight months. In addition to the twenty-three major clinical measures taken, consideration was also given to the group's performance within individual component categories of the DSS. For all measures the mean of the differences between the pre- and post-treatment scores were computed and analyzed for statistical significance. During the treatment period the children made gains on the raw scores for every one of the clinical measures. With the single exception of the Visual Sequential Memory subtest of the ITPA, on which pre- and post-treatment group scores were within the normal range, the comparisons showed these gains to be statistically significant. Although improved performance on the measures might be expected with increasing age of the subjects, the rate and nature of the positive changes for these subjects provided useful information about the effectiveness of Interactive Language Development Teaching.

TABLE 37 Means and standard deviations of pre- and post-treatment number of entries per DSS sentence within DSS grammatical categories and summary of the univariate analyses of variance for treatment effect over eight-month interval (25 ILDI subjects)

Categories	Pre-treatment Mean	Pre-treatment Standard Deviation	Post-treatment Mean	Post-treatment Standard Deviation	F-Ratio	Degrees of Freedom	p less than
Indefinite Pronouns	0.48	0.20	0.54	0.16	1.58	1,48	0.21
Personal Pronouns	0.60	0.25	0.84	0.24	10.75	1,48	0.01
Main Verbs	0.47	0.20	0.77	0.27	19.38	1,48	0.001
Secondary Verbs	0.08	0.04	0.11	0.06	3.34	1,44	0.07
Negatives	0.06	0.04	0.07	0.05	<1.00	1,41	
Conjunctions	0.12	0.13	0.12	0.08	<1.00	1,33	
Interrogative Reversals	0.09	0.07	0.08	0.06	<1.00	1,26	
Wh-Questions	0.05	0.04	0.05	0.04	<1.00	1,21	

TABLE 38 Means and standard deviations of pre- and post-treatment mean developmental scores or mean score per entry with DSS grammatical categories and summary of the univariate analysis of variance for treatment effect over eight-month interval (25 ILDT subjects)

Categories	Pre-Treatment Mean	Pre-Treatment Standard Deviation	Post-Treatment Mean	Post-Treatment Standard Deviation	F-Ratio	Degrees of Freedom	p less than
Indefinite Pronouns	1.84	0.44	1.97	0.32	1.42	1,48	0.24
Personal Pronouns	1.85	0.32	1.91	0.27	<1.00	1,48	
Main Verbs	1.59	0.42	1.87	0.33	6.24	1,48	0.02
Secondary Verbs	2.97	1.47	2.98	1.10	<1.00	1,44	
Negatives	3.76	1.06	4.87	1.27	9.46	1,41	0.01
Conjunctions	4.32	1.75	3.85	1.16	<1.00	1,33	
Interrogative Reversals	2.50	1.44	3.12	1.88	<1.00	1,26	
Wh-Questions	1.08	.29	2.90	2.37	7.00	1,27	0.02

Clinical children have been slowed or reduced in their language development relative to normally developing children. If presenting grammatical structures with the ILDT approach effected a rate of gain equal to or surpassing the rate of progress of normally developing children who are at the same stage of language development the effectiveness of the approach would be clearly demonstrated.

Developmental Sentence Analysis revealed the mean gain per child on the estimated age-equivalent score for the DSS was 10.8 months on this objective measure of the use of morphological forms and syntactic structures in spontaneous language usage. When this over-all language growth of 10.8 months was compared to the 8.3 months these clinical children were enrolled in treatment the effectiveness of Interactive Language Development Teaching was supported. The grammatical structures presented clinically, through emphasis in the story-conversation lessons, were used later by these children in their spontaneous formulations in conversation with an adult. Significant gains were also shown on other measures of the children's comprehension and expressive use of grammar.

Several useful findings resulted from the pre- and post-treatment comparisons. For example, on the pre-enrollment measures the group performance was clearly below age level expectations on measures of auditory sequential memory. Although at the end of the treatment-study gains were evident on these measures, these gains were minimal and less than those normally expected during such an eight-month developmental period. The auditory sequential memory difficulties continued for these youngsters. The important finding was that these clinical children improved their use of grammar at a rate faster than normal, relative to the progress of normally developing children at approximately the same stages of language development, while operating under the continuing constraints of limiting, poor auditory sequential memory skills. The comprehension and spontaneous use of syntax improved during the course of enrollment in Interactive Language Development Teaching despite the existing auditory sequential memory impairments.

The clinical cases' pre- and post-treatment performances on syntactic structures within the individual categories of the DSS were also studied. Mean developmental scores or mean scores per DSS entry increased in the Indefinite Pronoun-Noun Modifier, Personal Pronoun, Main Verb, Secondary Verb, Negative, Interrogative Reversal, and Wh-Question categories. The mean number of entries per DSS sentence increased in the Indefinite Pronoun-Noun Modifier, Personal Pronoun, Main Verb, Secondary Verb, and Negative categories.

In this investigation Developmental Sentence Analysis and Interactive Language Development Teaching were used to help clinical children in the use of grammar match and exceed the rate of progress of normally developing children who are at the same general stage of language development. The results demonstrate the effectiveness of clinical intervention through the clinical presentation of grammatical structure to children with language problems.

SECTION V

A GROUP REMEDIATION PROGRAM FOR CHILDREN WITH ATYPICAL SYNTAX UTILIZING OPERANT AND PROGRAMMED PROCEDURES

The experimental analysis of behavior has generated widespread interest in, and applicability to, all disciplines concerned with learning and learned behaviors. The field of speech and language pathology has applied the experimental analysis of behavior, or operant conditioning principles to the modification of specific speech and language disorders.

Operant conditioning is the process by which consequences or consequent events occur relative to responses which operate or act upon the environment (operants) so that the frequency of the response is controlled (Brookshire, 1967). It relies upon the presence of at least an approximation of the target response, or operant, within the subject's repertoire of behaviors. Reinforcement procedures consequently effect an increase or decrease in the frequency of occurrence of the operant. Basic behavioral principles as they apply to the fields of speech and language pathology have been discussed by Brookshire (1967), Girardeau and Spradlin, (1970), and Holland (1963; 1967).

The principles of operant conditioning have been effective in: (a) eliciting new specific speech and/or language terminal behaviors through the use of shaping by successive approximations, and in (b) modifying, strengthening or maintaining existent speech and/or language behaviors. The experimental analysis of behavior has been applied effectively to a number of specific speech and language disorder areas including stuttering (Shames & Sherrick, 1963; Ryan, 1970) and articulation (McReynolds, 1970; Mowrer, 1968).

Individual techniques for a variety of specific speech and language disorders have been detailed by a number of authors. In the area of language remediation, operant principles have been applied to autistic problems and the problem of elective mutism. Sulzbacher, and Costello (1970) presented a detailed case study of six year, five month old Teddy, a child with autistic behaviors. Utilizing remediation procedures in a behavior modification strategy, goals for treatment were: (a) deceleration of certain undesired vocal and nonvocal behaviors, (b) acquisition of the language and social skills required for success in school and, (c) generalization of skills to Teddy's environment away from the clinic. The language treatment program primarily consisted of the establishment of reliable control over Teddy's vocal and nonvocal behavior, initially through the designation of two prelanguage target behaviors: teaching eye contact and decelerating behaviors inappropriate to learning, such as jargon, and leaving his chair. Three specific language skills were selected as targets for language remediation and consisted of naming colors, pictures, and objects. Cues to ensure correct responding included imitative naming, "Say _____", then "What's this? Say _____" with a gradual increase in pause time between the question and the word "say." until "What's this?" was sufficient to elicit the target response. Inappropriate responses were prompted to correction by use of an imitative model in combination with a progressive fading-out procedure. A flash card technique was subsequently used to teach functional phrases, such as "May I have a _____" and "Thank you" goals were reportedly achieved within a five month treatment period. The child was later seen to establish more "functional conversation speech" referring primarily to sentence usage. Procedures were to expand his one-word labelling repertoire into sentence response chains through imitation, and to develop carrier or "pivotal" phrase constructions. The authors argue that behavioral principles can be applied clinically without sacrificing scientific rigor.

Schell and Stark (1967) have also reported on the application of operant conditioning procedures in the language remediation of a four and one-half year old autistic boy. The treatment progression involved teaching him to attend, increasing his responsiveness to people, effecting discriminative responses to a variety of controlled auditory and visual stimuli, and increasing the control of his behavior by verbal commands. A number of tasks were developed to prompt, develop, and maintain the extend and rate of his vocal and nonvocal behavior. The authors attribute the child's gain in vocal and nonvocal responsiveness to the systematic translation and application of tested behavioral principles. Straughan (1968) reports on the application of operant principles to the treatment of elective mutism. The author details two case studies in which classroom settings and therefore peer influence were used, such that both the subject and his peer group were reinforced for his vocal responses. The procedures were used successfully with one subject and partial success was achieved with the other, indicating that classroom conditioning can be effective when the target responses are in the subject's repertoire of behaviors.

Risely and Wolf (1967) summarized their research findings in the area of speech development in two echolalic children. They describe explicitly the application of procedures used, including shaping, the process of reinforcing behaviors which resemble the desired terminal behavior in successive steps. The authors describe (a) now once the terminal response is obtained, the response can then be shifted to imitative control by imitation training, for the development of speech, (b) differential reinforcement and time-out from positive reinforcement, (c) fading in of new stimuli and fading out of verbal prompts to transfer the speech from imitative control to control by appropriate stimulus conditions with the systematic variations in prompts including imitative prompt, complete prompt, partial prompt and, (d) generalization, the phenomenon of the occurrence of appropriate behavior under other than the original training conditions, or it may refer to the procedures used to establish this occurrence.

Sloane, Johnston, and Harris (1968) attempted to devise a standard set of remedial procedures based on a general approach of developing verbal behavior by providing immediate and concrete environmental consequences contingent upon specific verbal or vocal responses. A carefully graded progression of training steps were presented ranging from simple, nonverbal motor imitation to the development of multiple word chains and finally multiple s^D control.

MacAulay (1968) described her pilot project for teaching speech and beginning reading to eleven nonverbal retardates using operant conditioning procedures. Subjects ranged in age from nine to fifteen years with IQ scores from 27 to 92. The treatment program consisted of teaching individual sounds, blending sounds into words, teaching a naming vocabulary, and teaching word phrases. Although no formal baseline data were provided nor control procedures utilized, the author concludes that the application of operant procedures to speech and language training, can be successful. Kent et.al. (1972) described a first language acquisition program for institutionalized, severely retarded, nonverbal children from five to twenty years of age. The program was divided into two major sections, preverbal and verbal, with administration consisting of presentation of designated stimuli, accurate recording of client responses (including programmed targets and nonprogrammed responses), with immediate reinforcement of correct or nearly correct responses. The author details the progressive program of task steps such that program duplication by interested clinicians is possible.

Bandura (1965) argued that while operant conditioning methods are well suited for controlling existing responses, they are frequently laborious and inefficient for developing new behavioral repertoires. Bandura forwards a theory of no-trial learning or modeling. A modeling effect may occur such that the observer may acquire new responses that did not exist in his behavioral repertoire. The author suggests that learning is most frequently reflected in the unique combination of response components, or the evocation of previously learned responses by new stimuli. Exposure to models may strengthen or weaken inhibitory responses in the observer often as a function of rewarding or punishing response consequences to the model, called inhibitory or disinhibitory effects. In addition, Bandura describes a response facilitation effect in which the behavior of models may elicit previously learned responses that match or closely resemble those exhibited by the model. The author reviews a series of studies investigating these effects on the behavior of models. Bandura describes the role of vicarious reinforcement, and the power of self-reinforcement as techniques to maintain response levels. Bandura and Harris (1966) showed that fifty boys and fifty girls in the second grade from a middle-class community modified their syntactic style when verbal modeling cues, attentional and reinforcement variables were combined. Odom, Liebert, and Hill (1968) report two experiments examining the effects of reward, modeling, and attentional set on the acquistion of vowel syntactic responses. Experiment I had two purposes (a) to replicate Bandura and Harris' findings concerning the combined effects of specified social learning variable on the production of familiar constructions, and (b) to assess the combined effectiveness of such variables on the production of unfamiliar constructions, and to determine the effects of sentences conforming to the relevant construction rule. Three treatment conditions were utilized (a) an English Rule (ER) condition in which subjects were exposed to sentences ending in grammatically correct prepositional phrases and rewarded for producing similar constructions, (b) a (NR) New Rule condition in which modeled sentences end in modified prepositional phrases in the order article-noun-preposition, and rewarded for their production and, (c) a control group. Both experimental groups demonstrated an increase in the frequency of "grammatical" phrases relative to the performance of the control group. Experiment II indicated that although the subjects repeated modeled ungrammatical phrases of the type article-noun-preposition, they did not generate new ones. The general conclusion was that the particular combination of social learning variables employed affect the production of certain syntactic constructions already existant in the language repertoire of the child.

The application of modeling procedures to language has been investigated. Rosenthal, Zimmerman, and Durning (1970) reported on experiments investigating a model's influence upon children's formulation of questions regarding a set of stimulus pictures. Subjects were 140 culturally disadvantaged sixth grade children observing varied instances of questions based on nominal or physical stimulus attributes, functional stimulus cues, and causal relationships regarding stimuli, and judgments of value or preference concerning stimuli, and pictorial stimuli that differed in content, color, and number. Results indicated significant imitation of all question classes, with generalization of all question classes to new picture stimuli. Children's imitation of the grammatical parameters of sentence pattern, word content and tense of verb was investigated by Rosenthal and Whitebrook (1970). It was found that exposure to modeling produced large and significant imitative changes in content, sentence structure and verb tense; in addition, generalization occurred and was superior to the performance of a control group. The investigators further contrasted the promise of a money reward without specific instructions to copy the model, and a procedure in which instructions were given to copy the language model with no consequent reinforcement. Results were comparable, with the instructed - no incentive group performance favored slightly.

Peterson (1968) discussed modeling and imitation as subcomponents of the general area of observational learning. The author suggested that the development of an imitative repertoire is a necessary condition for language acquisition, and that modeling, the process of training by imitation involving matching the behavior of a model, may in itself become reinforcing. The model's behavior functions as a set of instructions programming the behavior of the observer and depends on factors specifically related to the model, including age, sex, and the consequence that follows the model's behavior. Liebert, Odom, Hill and Huff (1969) have reported on the effects of age and rule familiarity on the production of modeled language constructions with results indicating that the oldest group (C.A.: 14.1) performed best on measures of repetition of modeled constructions and productions of vowel sentences fitting the relevant rule. Neither rule familiarity nor age by rule interactions had significant results. Harris and Hassemer (1972) discussed the effects of modeled sentence complexity, age, sex, and bilingualisms upon the length and complexity of the sentence formulations of 96 second fourth grade children from New Mexico public schools. On the basis of the findings, the authors suggest that deliberately modeling complex sentences may effectively increase the length and complexity of the sentences children use. No sex differences were found. Of interest is their finding that even with or without any implicit or explicit instructions to imitate and without any reinforcement, children will compose longer and more complex sentences when they hear a model speaking simple sentences; the effect's of initial modeled sentences persist even when the modeled sentences become more or less complex.

Conditioning and programming procedures have been described in the area of syntax remediation in two reports of application. Gray and Fygetakis (1968) reported their attempts to develop a syntax teaching program using "programmed conditioning" procedures with five male and one female "dysphasic" children in the age range of 4.0 to 6.1 years. Individual programs were devised and administered by the classroom teacher or volunteers in group teaching sessions. Group and individual programmed conditioning time were part of every child's basic schedule of daily activities. Eight variables of the learning situation were considered to be critical and were regulated in program planning of each delivery system, including: stimulus, response, the type of modeling procedure to be used, the schedule of reinforcement, criteria, stimulus mode or method of stimulus delivery, response mode, complexity of the competing stimulus field. The teacher changed one variable at a time in the order: complexity of the competing stimulus field. The teacher changed one variable at a time in the order: complexity, model, response and stimulus modes, schedule, response, stimulus, and reinforcement with task progression consisting of vertical development and prompting at time of failure consisting of horizontal development. The authors conclude from the results of program application, that programmed conditioning is an effective language training procedure, effectively administered by trained volunteers. The authors interpreted results as showing acquisition, generalization, and spontaneous generation of previously programmed conditioned responses.

More recently Miller and Yoder (1972) have described a syntax teaching program using operant conditioning procedures based upon information on normal developmental language acquisition resulting in the delineation of sequential target behaviors, an instructional model, and a basic rationale for the teaching methods. The Syntax Teaching Program (STP) is divided into four successive stages of progressive difficulty. Stage I consists of single-word utterances; Stage II consists of word strings, with syntactic constructions and three-word sentences included in Stages III and IV respectively.

The purpose of this paper is to describe a group program for the treatment of oral syntax problems. The treatment construct is based upon the information available on operant, programming, and modeling procedures. The instructional model using programming procedures has been applied to language remediation planning within the developmental scale of syntax acquisition proposed by Lee (1974).

CONSTRUCT

A construct for group oral language remediation with children demonstrating atypical syntax has been devised utilizing operant and programming procedures. A comprehensive organizational plan based upon (a) DSA, (b) information on normal language acquisition, and (c) operant and programming procedures has been developed yielding a treatment program for individualized child language remediation presented in a group format. This treatment construct maximizes the number of correct productions elicited per child in small, carefully graded steps of progressive difficulty. It efficiently outlines the process of mastery necessary for the child to develop facility syntactically with the designated target structures.

The specific techniques of behavior modification considered were: systematic stimulus presentation and manipulation, graded response sequences; response shaping and manipulation; reinforcement principles; and extension of stimulus control. Consistent with these factors, two major areas of task difficulty requiring planning and consideration in developing the treatment construct were (a) the stimulus complexity of syntactic maturity of the forms, and thus the receptive task required of the child-client, and (b) the response complexity and therefore the expressive demands placed upon the child's performance.

Stimulus sequences. The verbal stimuli are planned under four major phases. The discrete substeps are adaptable to the child's needs and to the constraints of the language item presented, but four main steps appear necessary to stabilize a grammatic target at any given level of response difficulty. These are:

1. Presentation: The target syntactic structures is introduced; the vocabulary to be used at this level of response difficulty is taught; and the correct articulatory patterns are reinforced.
2. Establishment: Stimulus control is established. The target structure is presented in a series of ten response trials for each given substep to meet predetermined criterion levels, thereby establishing consistently correct responses with less direct stimulation.
3. Formulation: Task difficulty is again increased through systematic decrease in the directness of the stimulation. Decreasing the directness of the model provided is accomplished by using a series of questions or incomplete models.
4. Generalization: Extension of stimulus control is encouraged in this main step and the speech activity is more spontaneous. Description tasks are employed to achieve this.

Response sequences. The second factor to be considered is response complexity, or required verbal output. The stimulus steps and selected substeps are repeated for each level of response difficulty, as considered with regard to response length and contextual difficulty of the utterance. A number of parameters of oral expressive utterance were involved, including: length of utterance; type of utterance i.e. presentence, basic, sentence, or elaborated sentence formulations; and complexity of utterance with regard to level of maturity of the syntactic forms. Length of utterance was manipulated by gradually increasing the length of response required from a youngster within a program. This increase was planned to develop the sentence types. Therefore, the child progresses from imitation of a given target form at a one word level to generation of four unit or longer grammatically correct and complete sentences containing the target syntax. This development, or response building, reflects the normal process of language acquisition in which a youngster develops noun or verb phrases and then expands and combines them to form basic

sentences, complete simple sentences, compound and complex sentences with variations in declarative, emphatic, and interrogative sentence forms.

Program planning. The DSS provides a useful baseline measure for planning the over-all course of language remediation, and as a reassessment tool. As a direct extension of the syntax analysis achieved through the DSS, error forms are selected as program targets. Syntactic targets are selected to stimulate oral expression in general and to remediate specific error syntax.

Initial program planning focused on orienting the child-clients to the lesson routine, and therefore were within their language performance abilities. The orientation consisted of establishing the treatment setting in a positive manner and familiarizing the youngsters with the routines and procedures involved, without penalizing language performance; eliminating disruptive and inappropriate or interfering behaviors and reciprocally reinforcing a "set" of attending behaviors; and introducing reinforcement procedures including fading-in verbal reinforcement and fading-out tangible reinforcement.

Treatment was designed to reflect the process of normal language acquisition. Early-developing syntactic forms including indefinite pronouns, personal pronouns, and primary verbs were the initial focus of treatment. Within these grammatic categories, lower level forms were taught before higher level forms. For example, first person personal pronouns, and similarly uninflected verb forms were taught before the modals can, will, may + verb. As early-developing syntactic forms appeared more established, the somewhat later-developing secondary verbs, negatives, conjunctions, interrogative reversals, and wh-question forms were taught. Early in treatment targets were presented singly or in pairs within a program; later programs had multiple primary and secondary targets.

To exemplify this, the selection of targets for two the clinical children seen in this program are presented herein.

Child D.D. Initial analysis indicated that D.D. was at a pre-sentence level with basic sentences just emerging in spontaneous speech; early-developing syntactic forms were infrequently attempted and then were essentially in error. Vocabulary was limited. Behavior was immature.

Program #1: Goals in early planning were to introduce pronoun usage and to encourage consistent formulation of basic sentences. Appropriate responding behavior was reinforced and general behavior shaped with regard to cooperation and motivation. A possessive marker but no third person pronoun usage was attempted in spontaneous speech, therefore the possessive his was the initial target structure.

Target Structure: personal pronoun his
Secondary Structures: copula is are
indefinite pronouns these that
Four simple vocabulary items

Program #2:
Target Structure (s): personal pronoun I
present progressive tense verb form am + verb + ing
Secondary Structures: action verb vocabulary

Program #3:
Target Structures: plural personal pronouns we, our
present progressive verb tense are + verb + ing
Secondary Structures: action verb vocabulary

Program #4:
Target Structures: plural personal pronouns they, their
present progressive verb tense are + verb + ing
Secondary Structures: noun vocabulary (body parts)

Program #5:
Target Structures: personal pronouns he, she, his, her
present progressive verb tense is + verb + ing
Secondary Structures: noun vocabulary (body parts)

Program #6:
Target Structures: number aspect of pronominalization: he, she, they
present progressive verb tense is + verb + ing, are + verb + ing
negative contractions on auxiliary and copula verb forms

Program #7: regular past verb tense forms

Child A.H. This youngster demonstrated consistent basic sentence formulations in spontaneous speech but syntactic expression was immature and specific errors were evidenced in pronoun and main verb usage, at the time of the initial DSS.

Program #1:
Target Structure (s): possessive pronoun his
indefinite pronouns this, these
copula is
Secondary Structures: noun vocabulary (body parts)

Program #2:
Target Structures: personal pronouns he, she
present progressive verb tense forms
is + verb + ing
Secondary Structures: article + noun phrases
preposition + noun phrases

Program #3:
Target Structures: conjunction and combining balanced
units of pronouns, nouns, noun phrases,
and simple sentences.

Program #4:
Target Structures: regular past tense verb forms
personal pronouns he, she, his, her
contrasting gender and case; number was contrasing
with they, their
Secondary Structures: verb vocabulary (action)
prepositions on, over, up, under, with

Program #5:
Target Structures: wh-questions why, what, where
interrogative reversals using copula and auxiliary is, are.
personal pronouns he, she, they.

Program #6: tag questions
negative contraction didn't
personal pronouns he, she
irregular past tense verb forms

Program #7:
Target Structures: modal can
personal pronouns him, her, in the objective case

Program #8:
Target Structures: conjunction because
negative contractions

Each program consisted of a pre-written lesson or instructional plan designed to teach the designated target syntax. Instructional plans were comprehensive and detailed the stimulus and response sequences to be utilized. The substeps comprising the stimulus sequences were repeated for each response level. To develop facility with the target syntax, it was embedded in varying contexts in the form of ten response trials per substep. A response trial was defined as a set of interchanges between the child client following upon the delivery of the designated stimulus. This might include a number of utterances from the child-client and additionally might incorporate utterances from group peers. A sample program is provided in Chart 5.

Program Implementation. Individualized language lessons were presented in the form of pre-planned programs in a group format with the clinician mediating between the instructional plan and the child-client's language performance. Simple visual representations in the form of pictures or objects complemented each response trial, and were an integral part of the stimulus delivery. The group lesson functioned on a turn-taking basis with two twenty minute periods of programming and a final ten minute show-and-tell period used to provide a spontaneous speech activity and a time for day-by-day assessment of carryover.

An instructional plan record sheet Chart6 was developed to permit efficient recording or response by trial. Response adequacy of the target structures was determined and scored as either adequate (+) or inadequate (-). An adequate response was defined as a response utterance containing appropriate use of the target syntactic structure. If a response was incorrect, it was scored as a plus. However, on occasion some aspect of the response context might be in error; in this instance, again a complete and correct complete response was elicited before completing that response trial, but the child was given credit for correctly using the designated grammatic form.

Chart 5 Sample of Basic PLP Program

1) Presentation: the target structure is introduced and the correct articulatory pattern reinforced; new vocabulary is introduced.

Example:	Stimulus words	Expected response
	"his"	"his"

2) Establishment: the target structure is drilled until a correctly established response is consistently elicited with less direct stimulation.

a- Immediate Model:

Example:	Stimulus words	Expected response
	"his shoe"	"his shoe"

b- Delayed model:

Example:	Stimulus words	Expected response
	"his shoe, (child's name)"	"his shoe"

c- Immediate model-Repetition request-

Example:	Stimulus words	Expected response
	"his shoe"	"his shoe"
	"Tell me again"	"his shoe"

3) Formulation: encourage more spontaneous use of target structure in response to direct questioning and less direct stimulation.

a- Complete model + question containing Target structure:

Example:	Stimulus words	Expected response
	"his shoe. Is it his shoe?"	"(Yes) his shoe"

b- Question containing target structure:

Example:	Stimulus words	Expected response
	"Is it his shoe?"	"his shoe"

c- Wh-question

Example:	Stimulus words	Expected response
	"What is it?"	"his shoe"

d- Incomplete model:

Example:	Stimulus words	Expected response
	"(Child's name), look, Its..."	"his shoe"

4) Generalization: to promote spontaneous expressive use of target structure in carry-over activity.

a- Description, using original visual stimulus, the target structure must be elicited without supplying a direct model.

b- Description, using a new visual stimulus, the target structure must be elicited without supplying a direct model.

Chart 6

PROGRAM LANGUAGE GROUP
INSTRUCTIONAL PLAN RECORD SHEET

NAME: _____
B.D.: _____

Target Structures _____
_____
Secondary Structures _____
_____
Visual Supplementation: _____
_____
_____

esp. evel. Step	Substep	Stimulus Words	Expected Response	Resp. Adeq.			Reinforcement

This treatment construct not only provides a comprehensive guide to language remediation planning, but also functions as a hierarchy of stimulus events or prompts, which the clinician can use to modify the task and to elicit a correct response when the child's response attempt is in error. A response trial was never completed without a correct response being elicited. As the stimulus substeps reflect progressive levels of difficulty, then the reverse sequence represents a progressive reduction in task difficulty. One additional prompt type was included, a request for self-correction was the initial prompt used. At various intervals throughout the program, the youngsters were encouraged to make value judgments on the adequacy of their own responses, and then self-correction or peer-correction was encouraged. The youngster was then prompted to self-correct when a response attempt was inadequate. A criterion level was predetermined for performance in the program. If the youngster failed to meet criterion, the level of prompt necessary, frequently indicated the point at which to re-present the materials. For example, if the child was at a wh-question stimulus step, and failed to meet criterion, with prompts at a delayed model level necessary to elicit an adequate response, then re-presenting the program from the Delayed Model substep on was found to be beneficial.

Reinforcement contingencies are critical in this approach for three main reasons, (a) to maintain high response rates, (b) to maintain appropriate attending behaviors, and (c) to help the children discriminate and stabilize adequate responses. Tangible reinforcement was used initially under 100 and 50 percent reinforcement schedules with verbal praise faded-in and tangible reinforcement faded out such that high response levels were brought under the control of the clinician's verbal consequence. A back-up reinforcement in the form of a move on a game board was supplied achievement of criterion per substep. Time-out from responding was used to maintain long-term behavior management.

PROCEDURES

Treatment Format. Programmed Language Presentation (PLP) was used with eight children in the Northwestern University Speech and Language Clinics during the third year of the project. There were two language groups consisting of four children each. The groups were seen for one-hour clinical sessions four times a week in three eight-week treatment blocks. There was a non-treatment vacation period of approximately four weeks between the first and second eight-week treatment blocks and again between the second and third eight-week treatment blocks. Thus, the interval between the immediate pre-treatment and immediate post-treatment testing sessions was approximately thirty-two weeks or eight months. The statistical calculation of the exact time between the pre- and post-treatment assessments revealed a mean treatment interval of 8.5 months for the eight clinical children. The structure and presentation of the PLP lessons followed the procedures detailed earlier in this section of the report. The specific structures emphasized and the order of presentation of these structures within a series of lessons depended upon the capabilities of the children in the group determined from DSS assessment and the DSA grammatical model.

Clinicians. Twenty-four graduate students in the Speech and Language Pathology program participated in the treatment program, each for one eight-week block. Thus for each eight-week period there were eight graduate student clinicians involved in the program. Thus, for each group each clinician on a rotating basis conducted every fourth group story-lesson. All clinicians had completed at least one course in child language development prior to involvement in this project. All lessons were under the direct supervision of a faculty clinical supervisor holding the master's degree in Speech and Language Pathology.

The extensive pre- and post-treatment speech and language measures were taken by an examining speech and language pathologist, at the master's degree level, not directly involved in the treatment program. A clinical psychologist, at the doctoral level, experienced in assessing functioning in language impaired children also conducted pre- and post-treatment assessments.

Children in training. Programmed Language Presentation was used with eight clinical children from middle-class monolingual homes in the North Shore area of Chicago. The children were in the preschool age range of fourty-one to sixty-eight months. The mean age of the twenty-five subjects at the beginning of treatment was 51.5 months, with a standard deviation of 4.8 months. All the children included in this study had normal hearing, evidenced no general neuromuscular problems, and were within the range of normal on selected intelligence measures. All of the subjects evidenced reduced expressive language functioning. The mean delay in grammatical development for the eight subjects on their pre-enrollment language sample, as estimated with DSA procedures, was seventeen months.

Pre- and post-treatment clinical measures. In this preliminary study the twenty-three pre- and post-treatment tests and subtests included in this analysis were: Developmental Sentence Scoring (Lee and Canter, 1971; Lee, 1974), Northwestern Syntax Screening Test - Receptive and Expressive Sections (Lee, 1969), Peabody Picture Vocabulary Test (Dunn, 1959), Stanford-Binet Intelligence Scale Form L-M (Terman and Merrill, 1960), Preschool Attainment Record (Doll, 1966), Spencer-McGrady Sentence Repetition (unpublished test of ability to repeat sentences of increasing length with generally increasing grammatical load (Spencer, 1958 and McGrady, 1964), Oral Commissions subtest of the Detroit Test of Learning Aptitude (Baker and Leland, 1967), Illinois Test of Psycholinguistic Abilities - Total and Individual subtests (Kirk, McCarthy, and Kirk, 1968), Draw-A-Man Test (Harris, 1963), Developmental Test of Visual-Motor Integration (Beery and Buktenica, 1967), Memory Span for Digits Forward, Northwestern Articulation Proficiency Test (Canter, unpublished research edition).

FINDINGS

Pre-treatment measures. Obtained means, standard deviations, and minimum and maximum values for the raw scores on the twenty-three pre-treatment clinical measures are presented in Table 39. A similar listing of the means, standard deviations, and minimum and maximum values for the age-equivalent scores listed in months for sixteen of these pre-treatment measures which were appropriately converted to such estimates, are contained in Table 40. On pre-treatment testing the eight clinical cases seen for PLP obtained scores on the DSS which ranged from 0.69 to 6.72 with a mean DSS of 4.75 and standard deviation of 2.06. The mean estimated age-equivalent score in months on the DSS was 34.6, with a standard deviation of 8.0. Thus, as estimated by the over-all DSS, the average delay in grammatical development for these children was seventeen months upon their enrollment in the PLP treatment program.

As inspection of the pre-treatment measures summarized in Tables 39 and 40 revealed that these eight clinical cases, prior to enrollment in the PLP treatment, performed quite similarly to the way the twenty-five clinical cases seen for ILDT lessons performed prior to that clinical intervention. See Section IV of this report for a detailed discussion of those results.

The pre-treatment measures of the eight clinical children seen for PLP treatment maybe summarized as follows. They were found to be functioning over-all within a normal range of intelligence on selected measures but to have severe expressive language problems. Their deficits in language usage were most clearly shown on measures of expressive usage of grammar. These subjects also showed reduced comprehension of syntax.

TABLE 39 MEANS, STANDARD DEVIATIONS, MINIMUM AND MAXIMUM VALUES FOR RAW SCORES ON PRE-TREATMENT AND POST-TREATMENT MEASURES AND DIFFERENCE MEANS WITH t-VALUES FOR COMPARISONS OVER EIGHT-MONTH INTERVAL (8 PLP SUBJECTS, PRE-TREATMENT MEAN AGE OF 1.5 MONTHS POST-TREATMENT MEAN AGE OF 60 MONTHS).

Test or Subtest	Pre-treatment			Post-treatment			Comparison		
	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range	Difference Mean	t-value*	p less than
Developmental Sentence Score	4.75	2.06	0.69-6.72	6.21	1.35	3.76-8.06	+1.46	2.51	0.04
NSST - Expressive Section	9.3	6.7	2-18	18.5	8.5	3-26	+9.2	3.47	0.02
NSST - Receptive Section	22.5	5.9	18-34	26.5	4.1	21-31	+4.0	1.53	0.19
Peabody Picture Vocabulary Test	43.8	6.3	33-51	53.4	5.3	42-60	+9.6	4.34	0.01
Stanford-Binet Intelligence Test	102.0	15.5	74-124	105.5	13.0	81-124	+3.5	1.04	0.33
Preschool Attainment Record	74.8	18.6	56-101	82.2	17.3	59-106	+7.4	3.11	0.04
Spencer-McGrady Sentence Repetition	3.0	1.6	1-5	4.5	1.6	2-7	+1.5	2.51	0.04
Oral Commissions (DTLA)	12.1	5.2	0-17	16.2	3.1	12-21	+4.1	2.74	0.03
ITPA - Total Score	116.4	41.8	38-186	157.1	32.6	118-203	+40.7	4.20	0.01
Auditory Reception	14.0	5.1	8-24	16.6	5.6	6-26	+2.6	1.08	0.32
Auditory Association	12.8	4.7	6-18	15.8	5.1	6-22	+3.0	1.71	0.13
Auditory Sequential Memory	14.5	6.4	4-26	14.2	4.2	8-19	-0.3	0.17	0.87
Visual Reception	11.5	4.6	3-17	15.6	5.4	6-23	+4.1	1.69	0.13
Visual Association	13.0	7.5	0-21	17.9	3.6	11-22	+4.9	2.57	0.04
Visual Closure	8.8	2.9	4-14	10.3	2.0	7-14	+1.5	1.73	0.13
Visual Sequential Memory	9.6	7.4	0-20	12.5	3.7	7-19	+2.9	1.27	0.24
Manual Expression	14.2	7.8	0-27	20.6	7.3	9-33	+6.4	1.59	0.15
Verbal Expression	9.9	6.0	5-24	19.5	5.4	12-27	+9.6	2.97	0.01
Grammatic Closure	8.1	3.4	2-13	12.9	3.4	9-18	+4.8	5.05	0.001
Draw-A-Man (Goodenough-Harris)	4.4	3.9	0-10	3.4	4.8	0-11	-1.0	0.91	0.39
Developmental Test of Visual-Motor Integration	4.1	2.8	0-9	6.8	2.7	3-11	+2.7	3.39	0.01
Memory Span for Digits	3.1	0.4	3-4	4.0	0.5	2-5	+0.9	1.07	0.32
NU Articulation Proficiency Test	33.7	10.8	20-48	43.5	10.9	30-62	+9.8	2.48	0.04

*df = 7

TABLE 40 MEANS, STANDARD DEVIATIONS, MINIMUM AND MAXIMUM VALUES FOR AGE-EQUIVALENT SCORES IN MONTHS ON PRE-TREATMENT AND POST-TREATMENT MEASURES AND DIFFERENCE MEANS WITH t-VALUES FOR COMPARISONS OVER EIGHT-MONTH INTERVAL (8 PLP SUBJECTS PRE-TREATMENT AGE OF 1.5 MONTHS, POST-TREATMENT MEAN AGE OF 60 MONTHS).

Test or Subtest	Pre-treatment			Post-treatment			Comparison		
	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range	Difference Mean	t-value*	p less than
Developmental Sentence Score	34.6	8.0	20-43	41.5	7.4	30-54	+6.9	2.91	0.02
NSST - Expressive Section	27.3	5.2	24-34	39.5	10.6	24-51	+12.2	3.85	0.01
NSST - Receptive Section	40.5	17.8	28-76	50.8	12.2	34-63	+10.3	1.43	0.21
Peabody Picture Vocabulary Test	52.3	8.6	39-64	68.9	10.0	48-82	+16.6	5.07	0.001
Stanford-Binet Intelligence Test	51.0	10.1	33-67	62.8	8.2	50-73	+11.8	6.26	0.001
ITPA-Total Score	51.8	10.4	32-69	62.1	8.3	52-74	+10.3	4.20	0.01
Auditory Reception	49.9	9.8	39-70	54.9	11.2	35-75	+5.0	1.00	0.35
Auditory Association	54.5	9.4	41-65	60.6	10.4	41-74	+6.1	1.72	0.13
Auditory Sequential Memory	52.5	14.3	26-86	51.1	10.2	36-63	-1.4	0.21	0.67
Visual Reception	57.7	12.7	31-70	66.2	13.5	46-85	+10.5	1.62	0.15
Visual Association	52.1	24.6	42-75	66.5	9.0	50-78	+14.4	2.12	0.07
Visual Closure	46.6	8.9	30-60	51.8	5.2	42-60	+5.2	1.82	0.11
Visual Sequential Memory	49.6	28.3	24-87	59.9	11.8	43-82	+10.3	1.27	0.24
Manual Expression	52.4	27.7	42-99	72.2	20.3	40-99	+19.8	1.62	0.15
Verbal Expression	47.0	13.7	34-78	69.1	10.8	54-84	+22.1	4.17	0.01
Grammatic Closure	51.8	10.8	30-64	62.2	8.8	48-74	+10.4	3.21	0.01

* df = 7

Post-treatment measures. Obtained means, standard deviations, and minimum and maximum values for the raw scores on the twenty-three post-treatment clinical measures for this preliminary study of PLP treatment are presented in Table . As with the earlier presentation of the pre-treatment measures a similar display of the means, standard deviations, and minimum and maximum values for the age-equivalent scores listed in months is provided for sixteen of these post-treatment measures in Table 40. Information on the differences in performance by the eight children seen for Programmed Language Presentation prior to and following enrollment of approximately eight months in the program is contained in both Table 39 and Table 40. Under the third general column, labelled "Comparison," the first sub-column contains information on the mean of the differences between the pre- and post-treatment scores for the eight clinical children, raw scores in Table 39 and age-equivalent scores in Table 40. The final two sub-columns contain a summary of the comparisons made with a correlated t-formula (Ferguson, 1971). The 0.05 level of confidence was selected as the minimum in citing significance for the results of the statistical comparisons. In a less conventional modification, the confidence levels of all comparisons were reported as possible indicators of trends in the findings from this preliminary application of PLP. Developmental Sentence Analysis of the spontaneous language usage of these eight children following the PLP treatment period resulted in DSS scores ranging from 3.76 to 8.06 with a mean DSS of 6.21 and standard deviations of 1.35. The mean DSS increase for the eight subjects was 1.46. At the end of the PLP treatment period the mean estimated age-equivalent score in months on the DSS was 41.5 months with a standard deviation of 7.4. The mean gain per child was 6.9 months on this objective of their expressive usage of grammar.

Mean age-equivalent score increases were obtained on other expressive language measures, including a 12.2 month gain on the NSST Expressive section, a 22.2 month gain on the Verbal Expression subtest of the ITPA, and a 10.4 month gain on the Grammatic Closure subtest of the ITPA. Improved understanding of comprehension of syntax was indicated by the mean age-equivalent gain of 10.3 months obtained on the NSST Receptive section.

In general the results of this preliminary study of the programmed presentation approach to language intervention seemed to reveal gains in language behaviors more restricted to the specific target feature of the treatment program, i.e., increasing the maturity of the syntactic structures and morphological forms used, than were the apparently broader gains evidenced by the clinical children seen for Interactive Language Development Teaching. This raises questions for future research on contrasting approaches to language intervention.

SECTION VI

DISSEMINATION OF PROJECT INFORMATION

Herein are listed publications, papers, and films thus far prepared as a direct result of the clinical research effort documented in this monograph. The dissemination of information arising from this project funded by the U. S. Office of Education Bureau of Education for the Handicapped will continue. The material which it has produced appears to be statistically sound, clinically applicable, and professionally useful. It is the intention of the project directors to continue not only their dissemination activities but also their investigation of other aspects of clinical language problems which have emerged as a result of these studies. See Section I of this report, in addition, for a summary of workshops, short courses, and seminars conducted or scheduled for eleven state speech and hearing associations, fifteen universities, and conferences in six foreign countries.

Craig, Holly K. and Roy A. Koenigsknecht
1973 A Group Remediation Program for Children with Atypical Syntax Utilizing Operant and Programmed Procedures. Paper delivered to the American Speech and Hearing Association Convention, Detroit, October, 1973.

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